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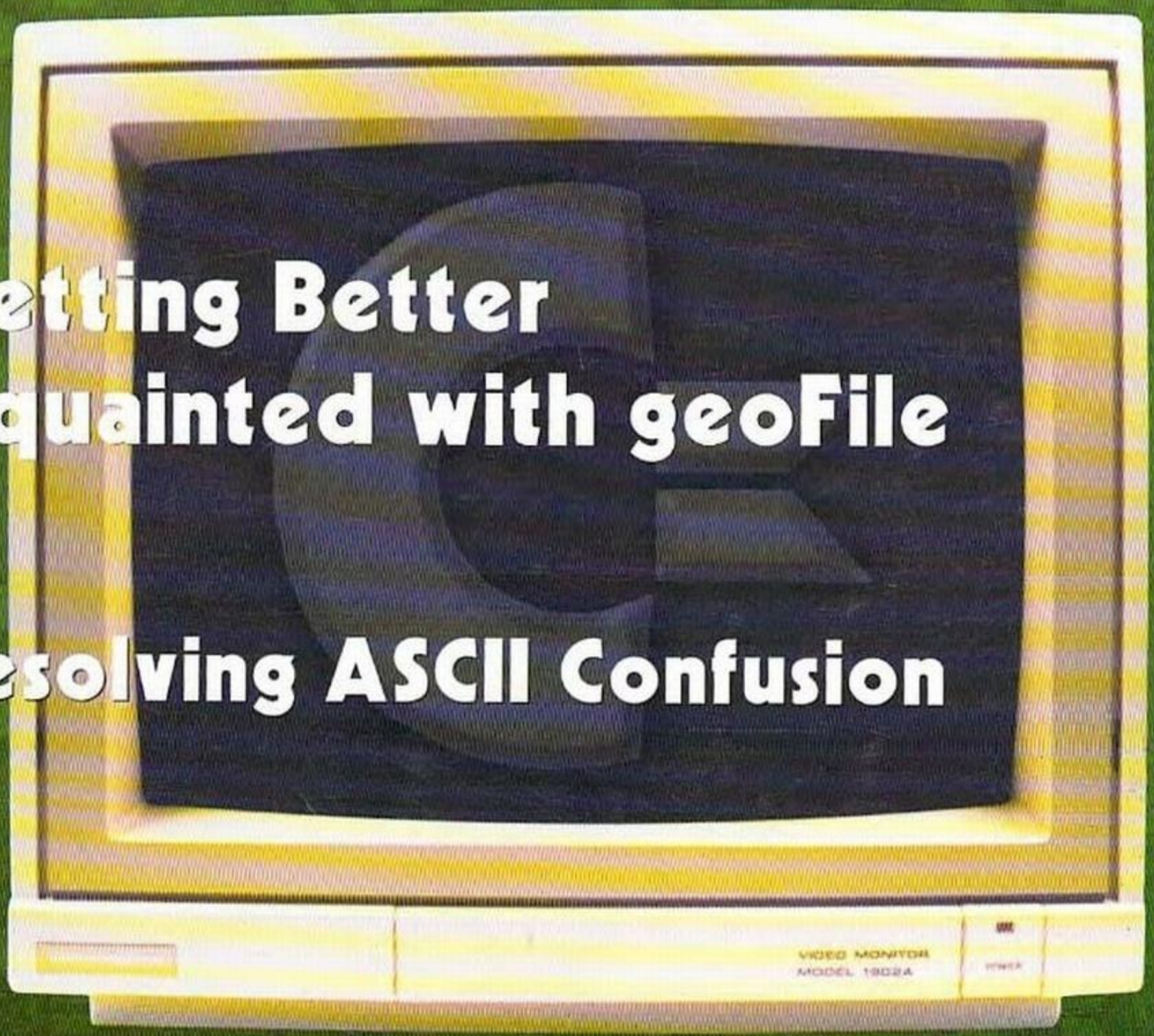
commodore WORLD

THE NEWS MAGAZINE FOR COMMODORE 64 & 128 USERS



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FROM THE EDITOR

Weathering The Storm

Just a few weeks ago the employees of Creative Micro Designs and Commodore World were treated to one of New England's harshest spring storms to date, as nature dumped some two feet of heavy snow in our area. Some of us were without power for a couple of days and I personally had the great fortune of having a tree split, part falling in my yard and the other part across my driveway. But we all survived, and while there was a lot of cleaning up to do afterwards, the real damage was minimal.

In the realm of today's Commodore market, we're sometimes challanged by similar storms, both as users and as suppliers. Large setbacks happen from time to time, and we simply do what we must to weather the storm. At Commodore World we've had our share of 'storms', though possibly none so bad as that which we've recently been through. The storm I speak of here is the loss of subscribers we have seen in the past few months, which has been rather dramatic. Sadly, our loss is also the Commodore community's loss, as the vast majority of those whom have let their subscriptions lapse have done so because they simply aren't actively using Commodore computers anymore.

Sad as this may be, we've carefully analyzed the situation, and taken what we feel are the necessary steps to keep Commodore World in production. Without this publication, many of the remaining users and suppliers would simply cease to exist in the Commodore market. This considered, we feel a strong obligation to do whatever we can to make sure that we're around for a long time to come. Yet, the publication must work within the budgetary confinements dictated by the size of the subscriber base.

While many of the changes will be evident directly in our pages, possibly one of the largest is not—we'll no longer have an assistant editor to help create Commodore World. This makes putting the publication together that much more difficult. However, we've eased that somewhat by reducing the number of pages, a step that was necessary in any case to reduce cost. With reduced pages comes the obvious loss of some regular columns, though we've tried to pad the impact of that by constraining some of the larger columns to fewer pages. This will fluctuate from time to time, however, as particular subjects need more or less space. We'll also probably see some of the old columns make occasional appearances when room permits, so don't count them out entirely.

Meanwhile, there are some positive things happening as well. We've had a small surge in new advertisers, and there a couple in the wings that may join in soon. New releases, while coming slowly, are indeed coming. So hold on to your keyboards—we not done yet, not by a long shot!

Doug Cotton
Editor

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LOADSTAR® MONTHLY

LOADSTAR is a monthly "magazine on disk" for the Commodore 64/128. Subscribers receive two 1541 disks (or one 1581 disk) in their mailbox every month packed with news, articles and programs. These non-PD, high-quality programs are written by the best home-based programmers in the field and edited by the crack LOADSTAR team of Fender Tucker and Jeff Jones. Subscription prices are at an all-time low of $69.95 for a 12-month subscription, or $19.95 for a three-month subscription. You may also elect to subscribe "by the month," where we charge your credit card $7.95 for each issue after it's shipped. We also offer the long line of standalone products below.

✔ NEW Games Disk! **The Compleat Jon:** 11 Games! The whole gamut of gaming is covered here: artificial intelligence, role-playing, mazes, fantasy, science fiction, education and even non-violence (which was a radical concept in its time). These eleven games are among the best ever published on LOADSTAR. Listed on the menu in chronological order, so you can see how Jon's style changed as the years rolled by. **1581 disk 0021D3 $20. 1541 disk #0036D5 $20**

✔ NEW Puzzle disk! **The Compleat Crossword:** Every crossword puzzle published in Puzzle Page in one huge collection! 220 puzzles! It uses Barbara Schulak's CRUCIVERBALIST program to present the puzzles and allows you to "mark" a puzzle when it's solved so that you know which you've solved and which you haven't yet. Each 1541 disk contains 110 puzzles. **1581 Disk #0020D3 $20. Disk 1 (1541) #0036D5 $10.Disk 2 (1541) #0037D5 $10**

✔ NEW C-128 Productivity! **The Compleat Lee O:** Six of Lee O. Clinton's best serious programs for the C-128 80- column mode. Finance, auto expense, kitchen helper, genealogy, resume writing, mutual funds! **One 1541 disk #0032D5. One 1581 disk #0017D3 $10.00**

✔ NEW Word Search! **Super Star Search 1:** 200 original word search puzzles by Steven Thomas and Art Dudley, presented by John Serafino's modern point and click program. **One 1541 disk #0011D5 One 1581 disk #0008D3 $20.00**

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PS Graphics! Compleat PS Vol. 1 (The Print Shop by Broderbund or Printmaster required). Over 1300 artistic and never before published PRINT SHOP images. Scan through the many PRINT SHOP images sequentially, by name, or by group number. Press a key and save the graphic you want in 2-block, 3-block and even PRINTMASTER graphic files! All that plus a printed guide! Each volume is $20.00. **Vol. 1: C-64/128 3.5-inch disk item #0001d3. 5.25-inch disks item #0009d5. Vol. 2 (graphics from past LS issues): C-64/128 3.5-inch disk item #0002d3. 5.25-inch disks item #0010d5.**

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LOADSTAR presents the biggest Geos collection of clip art and fonts ever offered at one time. All of the Geos art that's ever appeared on LOADSTAR, as well as some great files from Geos fanatic Dick Estel, are available on twenty 5.25 inch disks or eight 3.5 inch disks. Most of this has never been seen before! Use these graphics in your GeoPaint, GeoWrite and GeoPublish documents or convert to FGM with FGM utilities. Spiff up your GeoFAX documents with the appropriate graphic -- every time! Prices are $20 for any two 3.5 inch disks, or any five 5.25 inch disks. You can purchase the whole collection for $75 for either version. Call LOADSTAR toll-free at 1-800-594-3370 or 1-318-221-8718 to order by credit card. Or send check or money order and specify (by LG number) which disks you want.

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Disk 04 - OTTOWA/PRIME CLIPS: Artwork of the main landmarks of Ottowa; plus high quality public domain clip art **#0015D5**

Disk 05 - FONTS: More than 30 fonts from past issues of LOADSTAR, plus articles (in geoWrite format) on creating fonts. Also two ready-made headers for use with your own documents, one a picture of a mail truck; the other reading FROM THE DESK OF **#0016D5**

Disk 06, Disk 07, and **Disk 08** - geoPaint and Photo Album files with the great clip artwork featured on past LOADSTARS - Includes GeoCurmudgeon, Anamalia I and II, Australian Animals, Valentine art and many more **#0017D5, #0018D5, #0019D5**

Disk 09 - GOODYKOONTZ FILES - Jasper Goodykoontz, born in Indiana in 1855, produced Goodykoontz's Perpetual Calendar and General Reference Manual (A Book for the Millions). This disk includes scans from the book of a wide array of subjects -- Gestures and Attitudes, Poultry, Craniology, and more. **#0020D5**

Disk 10 - OLD WEST: Scanned Artwork from Dick Estel's FRD Software - mostly woodcut style art of the old west, gold rush days and pioneer scenes. **#0021D5**

Disk 11: J. Neely Art/Animals: Jennifer Neely works with a wide variety of subject matter and materials. Disk contains some of her favorites, scanned into geoPaint format. Side 2 is a collection of scanned artwork of animals from FRD Software **#0022D5**

Disk 12 - HOLIDAY: Artwork for New Years, Valentine's, St. Patrick's Day, Halloween, Thanksgiving and Christmas **#0023D5**

Disk 13 - PEOPLE/FACES: Scenes of people and faces from FRD Software **#0024D5**

Disk 14 - FRD CLASSICS: Dick's choice of the best of the FRD collection **#0025D5**

Disk 15 - DINOS/CLASSICS: Dinosaurs and other prehistoric beasts, as well as more first choice artwork from FRD. **#0026D5**

Disk 16 - SPORTS/MISC: Dozens of sports-related clips **#0027D5**

Disk 17 - OFFICE AND SCHOOL: Clips to be used at work and around the house **#0028D5**

Disk 18 -MUSIC & MORE SCHOOL CLIPS #0029D5

Disk 19 - SEASONAL AND HOLIDAYS: A clip for any occasion **#0030D5**

Disk 20 - SEASONAL AND HOLIDAYS: A clip for any occasion **#0031D5**

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Disk 4: Equals 9, 10, 11A #0012D3
Disk 5: Equals 12, 13, 11B #0013D3
Disk 6: Equivalent of Disks 14, 15 and some bonus files not on 5.25" disks **#0014D3**
Disk 7: Sports, Office and school, Music #015D3
Disk 8: Music, Holiday and Seasonal #016D3
For your convenience, GeoViewer is included on each volume. GEOS 2.0 is suggested.

Free Shipping! For Every Item on this page!

Diskfulla Card Games! The Compleat Maurice: A compilation of 26 solitaire card games written by Maurice Jones, the acknowledged master of card game simulations for the C-64/128. There's even a brand new, never before published game called Boomerang. **Two 5.25 inch disks #0007D5 or one 3.5 inch disk #0007D3. $20.00 postage paid!**

Oodles Of Stunning Art! Tutorials! The Compleat Walt: During LOADSTAR's first ten years we have published 24 of Walt Hamed's slideshows and multimedia events. Now we've gathered them into one huge collection: seven 5.25 inch disks or three 3.5 inch disks! There are over 250 pictures, including some that have never been published. The greatest one-man collection of art on any computer platform. **5.25-inch disks order #070425 3.5-inch disks order #070423. $20.00 postage paid!**

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BACKTALK

LETTERS AND QUESTIONS FROM OUR READERS

Dear CW,

In Issue #17's Graphic Interpretation column I get the impression that Perfect Print LQ will work with a 9-pin Star NX-1000C Commodore ready printer. Others have told me it won't work with Commodore-compatible printers. I have an NX-1000C. Will Perfect Print LQ work with my printer?

Indeed it will, but only because your printer actually has dual emulations—Commodore and ASCII (the latter is actually a very good Epson FX-80 emulation). To take advantage of this capability, you'll need to change some settings on your printer's dip switches.

According to the NX-1000C Printer Manual, dip switch #5 controls the emulation. In the OFF position, it emulates a Commodore 60 dpi (dot per inch) printer, such as the 1525 or MPS 801. In the ON position, the printer emulates the Epson FX-80, which is an 80 dpi printer with the ability to print up to 240 dpi.

You may also need to change the setting of dip switch #1 (auto line feed) for some applications. If this switch is in the ON position and you notice that you're getting white bands in graphic output, turn it OFF. If it is OFF and you notice that all your print is coming out on the same line, turn the switch ON.

Any programs that you have which support Epson printers will usually provide you with a much better quality printout in the ASCII mode than they will in the Commodore mode, but you may find that some of your programs only support printing in Commodore mode. For those programs you'll need to set dip switch #5 in the OFF position to select Commodore mode.

If you have been using Commodore mode for printing with GEOS, and then switch to using Epson mode, you should be aware of some differences. GEOS applications are designed to print 640 dots per line (80 dpi over 8 inches). When using a Commodore-compatible printer (60 dpi), you can only fit 480 dots on a line. So with most applications you generally need to move the margins inward while using a 60 dpi (Commodore-compatible) printer mode; this is no longer the case when you start using an 80 dpi printing mode, because this is exactly what GEOS was designed for.

Also, in ASCII mode you'll need to use a different printer driver. I suggest using the Epson FX-80 driver if all you have are the drivers that are supplied directly with GEOS. The Epson8pin3pass driver is an excellent alternative if you have access to it; you'll find it in many PD collections, online or on the GEODRIVERS1 disk from CMD. With Perfect Print LQ, the default driver is perfectly suited to this print mode on the NX-1000C, and this provides the very best quality output you'll get from GEOS.

Dear CW,

Like your [CMD] advertisement says, FD series is fast, HD is faster, RAMLink is fastest at loading GEOS and applications. Is it possible for the GEOS System Disk to be installed on a chip like JiffyDOS, which could be switched on or off? It would certainly be more convenient and allow the user to make his/her own configurations.

Putting GEOS on ROM is a bit of a sticky business for a couple of reasons. First, CMD would need to get permission from Geoworks in order to do this at all, though that wouldn't prove too difficult. Next, portions of GEOS would need to be patched so that GEOS would operate from ROM; this is a little more difficult, though not insurmountable.

That said, let me add that CMD has previously considered doing this. In fact, Geoworks actually proposed the idea to CMD before they took over distributing the product. Geoworks was curious about having CMD create the hardware for them in that particular case.

Why it never came to be can probably be pinned on the combination of the development costs, and the higher cost of the 'medium' (a ROM cartridge) that the user would have to pay for. In addition, there's actually a better solution.

While booting the main files from ROM would be exceptionally fast, GEOS still needs to check for certain items on disks before the boot process is completed.

Imagine for a moment that you had GEOS on ROM, and bought a new device that required replacing the default CONFIGURE file. If CONFIGURE were in ROM as well, you just wouldn't be able to add new hardware to your system this way. So CONFIGURE and other autoexec files need to be on disk. Given this, which device should be searched for CONFIGURE? Before you answer that, let me warn you; no matter which device you check, or even if you check them all in a specific order, someone will want it done differently.

There are other similar scenarios with GEOS, such as users who want to use an alternative to the deskTop. To allow for this, deskTop too may need to be on disk. What it boils down to is that a ROM version is generally less configurable.

As many users know, GEOS tends to crawl without RAM expansion. Yet, there's only one expansion port on a Commodore computer, and both the cartridge and RAM expander need it. A ROM could be put directly into a Commodore REU (there's an empty socket for this purpose), but that leaves out users with other RAM devices like GEORAM or BBGRAM. These users will also need a cartridge port expander to use both devices together. So in many cases, GEOS on ROM is also less convenient.

As I mentioned before, there is a better solution, and that is RAMLink. Using geoMakeBoot to install GEOS directly on RAMLink provides booting of GEOS that is actually faster than ROM, because the extra files like CONFIGURE and the deskTop that have to be loaded can also come from RAMLink, and at a speed much faster than any other drive. RAMLink also lets you use alternatives to deskTop, and to configure the booting of the system as you see fit. Yes, it's way more expensive than GEOS on a cartridge alone, but RAMLink also serves as the RAM expander.

RAMLink has other virtues—it's expandable, is very usable outside of GEOS, and is also fully configurable for autobooting—both for the 64 and 128. So combined with geoMakeBoot, I think it's the best GEOS cartridge possible.

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ON THE HORIZON

COMMODORE AND COMPUTER INDUSTRY NEWS

Now Shipping: geoFAX 2.0

Maurice Randall recently announced that GEOFax version 2.0 is finished and available. The following release was supplied:

> Even though geoFAX is a relatively new program, there is already a more powerful upgrade available. All current owners of geoFAX version 1 are entitled to a free upgrade directly from the author, Maurice Randall. In order to receive the upgrade, you must send in your geoFAX registration. If you have lost the registration, then simply send in your original disk.
>
> V2.0 Highlights:
> - Built-in file copier, renamer, and deleter
> - Improved geoFAX to geoPaint utility
> - Improved fax send/receive performance
> - New phone directory
> - More configurable
> - Improved printer drivers with HP and Canon support
> - Onscreen fax viewer
>
> geoFAX V2.0 pricing remains at $39.95 plus shipping and handling and requires GEOS 64 or 128 V2.0, a Turbo232 or SwiftLink cartridge, and a Class 2 or 2.0 modem with at least 16K of internal RAM. A SuperCPU is highly recommended for improved performance and faster printing.

Internet Book For Commodore

The Internet is a big place and it's not always easy to find all the in's and out's about taking advantage of its features when checking it out for the first time. There's a lot of Commodore specific information available on the Internet, but you have to know how to get to the information, and that can be a Catch-22.

How do I get on the Internet? What term programs can I use? What the heck is FTP? Can I browse the World Wide Web with my C64? *The Internet for Commodore Users* covers Hardware Basics, Terminal and Modem Basics, Finding an Internet Provider, Getting Online and Signing Up, UNIX Shell Account Basics, Email, Text Editors, Newsgroups, Telnet, Rlogin, FTP, Archie, World Wide Web, Gopher, Internet Relay Chat (IRC), Offline Mail Reading, Sending and Receiving Files, Mail Lists, Using Email to access other Internet services, and more. The book also contains a comprehensive Glossary, Commodore Terminal Program Key Equivalents, a Products Source List and Internet Resource List.

Author Gaelyne Gasson (formerly Gaelyne Moranec), once editor of CEE-64 Alive!, has been writing about Commodore computers and modeming for several years, with columns and features in Commodore World and BBS Magazine. She has also written about Commodore computing for other publications such as: C=Hacking, Commodore Network, and Loadstar. After answering countless letters helping others learn the ropes of telecommunications, she has written this book specifically for Commodore users who want to take advantage of the Internet.

The Internet For Commodore Users is to be packaged with a special version of Novaterm v9.6 Lite by Nick Rossi, and is being published by VideoCam Services, owned by Rod and Gaelyne Gasson.

The Internet for Commodore C64/128 Users, ISBN: 0-646-31615-X, $36.95 Australian (presently about US$29.95) plus shipping: $5.00 AU to anywhere in Australia; International Express: $15.00 AU (US$12.00); Airmail: $10.50 AU (US$9.00); Economy Airmail: $8.00 AU (US$7.00).

Orders can be accepted through postal mail, Email, phone or from the World Wide Web at http://hal9000.net.au/~moranec/bookord.html.

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Caloke No Longer in Operation

Caloke Industries, a supplier of public domain software for the Commodore market who has often advertised in Commodore World's classified ads, has recently ceased operation. No further details were available at press time.

CPU Joins Deadbeat Publication List

Commodore Power User, a publication which recently advertised in Commodore World, has apparently joined the long list of Commodore publications that have taken the money and run. Based on customer complaints, Commodore World has been trying to locate the publisher, Tom Gosser, for comment. The phone number supplied by Mr. Gosser is now reported to be out of service.

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Commodore World deeply regrets any loss our subscribers may have taken in subscribing to CPU, and has given much consideration to changing our policy on allowing advertising by other publications within our pages. However, we feel it would be even more of a dis-service to the Commodore community if we were not to give other publishers an opportunity to make their publication known, and it's impossible to know in advance whether an advertiser will fulfill its obligation. We do wish to once again warn our readers to carefully consider purchases with any company or individual they are not familiar with.

CMD Set to Release SuperRAM Card for SuperCPU 64

Creative Micro Designs, Inc. has announced that it will begin production of the SuperRAM card for the SuperCPU 64 the first week of May.

The card holds up to 16 MB of RAM which can be directly accessed as program memory by the SuperCPU 64, and will be sold both separately and in bundles with the SuperCPU in various memory configurations. CMD noted that a user-installable ROM upgrade will accompany cards sold to existing SuperCPU 64 owners.

It was also announced that a GEOS driver was exected to ship with the card that would allow the extra RAM to be used as high-speed RAM disk with GEOS applications. CMD indicated that transfer speeds of 2 MB per second should be easily attained in such an application, about double the speed of DMA transfers using a Commodore REU.

Initial prices for the card are slated at $79.00 (no RAM), $94.00 (1 MB), $119.00 (4 MB), $149.00 (8 MB) and $199.00 (16 MB). SuperCPU 64/SuperRAM bundle prices are initially set for $259.00 (no RAM), $274.00 (1 MB), $299.00 (4 MB), $326.00 (8 MB) and $379.00 (16 MB). CMD cautioned that prices are subject to fluctuate based on RAM prices. Further technical details about the SuperRAM card can be found in this issue's installment of *816 BEAT*.

In other news from CMD, work continues on the SuperCPU 128. The RAM circuitry for this card is now complete, as is the daughtercard which is installed in the computer's MMU socket (the MMU in turn is placed on the daughtercard). In addition, about half of the Super128/RAM card has been physically laid out. The remaining work left is in completing the 128 MMU emulation logic for the Super128 CPLD, laying out the daughtercard, finishing the layout of the Super128/RAM card, and testing the final design. While CMD feels these stages won't take a lot longer, they caution that once everything is finalized and approved, it still requires about 6 to 8 weeks to get the final product into production from that point.

Commodore & Amiga Moving to Gateway 2000?

There's been a recent flood of press releases and messages on the Internet concerning the sale of Amiga Technologies, the ESCOM division that presently has the rights to the Commodore 8- and 16-bit computers. The US firm Gateway 2000 has placed a bid on buying this division as part of ESCOM's bankruptcy liquidation, and the bid has been accepted. Final say in the matter, however, is dependant on the German courts, so the sale is not final at this point. Gateway 2000, a large manufacturer of Intel PC's that use a Microsoft operating system, says that they will continue to develop and manufacture Amiga products if the sale is approved.

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COMMODORE TRIVIA

by Jim Brain

Welcome to another edition of Commodore Trivia. As many of you may know, these trivia questions and answers have been donated by me to the Commodore community at large. Unlike other articles in *Commodore World*, these trivia questions have been placed in the public domain. I ask only that the trivia questions remain intact and unchanged, and that my name and address appear somewhere so users can contact me. The trivia is also used for a contest I run on the Internet; contact me at the included address for more information. Because curiosity has the best of me, I always welcome a note or postcard detailing where the trivia goes. I also welcome new questions—provided they come with the answers. Enjoy!

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COMMODORE TRIVIA #18 QUESTIONS

$120) What is the model number of the assembler/monitor for the KIM-1?

$121) How many LEDs are on the KIM-1?

$122) What is the model number of the REC chip used in the REU?

$123) At least two versions of the above chip exist. What is the main physical difference between the versions?

$124) Why couldn't regular Atari(tm) style joystcks be used with the Commodore Plus/4 series?

$125) What was the first joystick model Commodore produced that would function with the Plus/4 computer line?

$126) How many computer models are included in the Plus/4 line?

$127) In a normal Commodore disk drive Directory Entry, what relative offset denotes the start of the program name?

$128) How many tracks in a 1541 or 4040 are normally available for use as storage?

$129) How many bytes comprise a single disk drive directory entry?

$12A) What is the model number of the Commodore dual drive with a total capacity per unit of 2.12MB?

$12B) On the drive denoted in $12A, how large could a single sequential file be?

$12C) At least two version of the Commodore 64C keyboard exist. What is the difference between them? Extra Credit: Why?

$12D) On the Commodore 64, what area of memory is swapped out when using an REU with RamDos?

$12E) Commodore manufactured two different versions of the 1541-II drive. What is the difference between them?

$12F) How many colors could the Commodore 1520 plotter plot in?

$130) The Commodore Plus/4 was referred to as the "_____ Machine".

$131) Although the Commodore 16 and 116 were functionally equivalent, what two physical characteristics distinguished one from another?

$132) How many pins are on the Commodore plus/4 expansion port connector?

$133) On which side of the Commodore 65 (as it is facing you) did Commodore place the power switch on?

$134) How many keys are on a standard Commodore 128 keyboard?

$135) What color are the drive LEDs on the SX64 drive?

$136) True or False? The Commodore 64 and VIC-20 keyboards are interchangeable.

$137) On a 1526/MPS 802 printer, how many redefinable characters were available for use per line of text?

$138) To set up a redefinable character on the MPS 802/1526 printer, what secondary address must be opened?

$139) How many pins are in each Euro-DIN plug used on the Plus/4-C16 joysticks?

$13A) How many pins are on a regular Commodore VIC-20/C64 joystick connector?

$13B) What BASIC command is used to change from C128 mode to C64 mode on a C128?

$13C) What were the four integrated programs included in the infamous "3+1" software in the Plus/4?

$13D) Which Commodore serial printer(s) had a small switch that allowed it to be addressed as either device 4 or device 5?

$13E) How many addressable registers does the Commodore VIC-II IC have?

$13F) On a Commodore PET machine, what output appears on the screen after typing in SAVE "",2?

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COMMODORE TRIVIA #17 ANSWERS

$100) 23 keys. The keypad has room for 24, but one spot is taken by a switch that puts the system into single-step mode. Interestingly, some pictures have the switch on the upper left, some on the upper right.

$101) GO (Go) Executes an instruction and displays the address of next, ST (Stop) Stops execution of program and return control to monitor, RS (Reset), AD (Address) Address entry mode, DA (Data) Data entry mode, PC (Program Counter) Displays and restores program counter to values in PCL and PCH, + (Increment) Increments the address without changing the entry mode.

$102) The KIM-4.

$103) I guess I should have stipulated that this is a bitmap. ASCII just has a few limitations. Anyway, the correct bytes to send are: 255, 193, 193, 255. You got these by assigning each bit in a column a value, and adding 128 to the result for each column.

$104) Character resolution: 80 chars, or 10 chars/inch (cpi). Graphics resolution: 480 dots, or 60 dots/inch (dpi).

$105) The two commands read in data from a disk sector. However, the U1 command always reads a full sector (255 bytes). The B-R command reads the number of bytes specified in the first byte of the sector. If the first byte is a 15, B-R will read 15 bytes from the sector. (From the 1581 manual)

$106) This command has been traditionally used to reset Commodore drives, including the CBM 1541. However, some early versions of the Drive DOS did not correctly handle this command. In these versions, the drive and computer failed to complete the command transaction successfully, and what looked like a hung machine resulted. Commodore later fixed this problem. If U: seems to not work on your drive, try U; instead.

$107) The function, called SETLDA and residing at $C100, turns on the drive active LED for the current drive. The routine loads the current drive from $7F and sets bit 3 of DSKCNT ($1C00).

$108) 296 files. Note that it is not a multiple of 144.

$109) COPYRIGHT CBM 86

$10A) USR.

$10B) If one depresses the right mouse button during power-up, the 1351 will behave just like a joystick.

$10C) Each register holds the same type of information, just for a separate axis, so we will describe just one register:

Bit: Function
7 Don't care
6-1 Mouse axis position mod 64.
0 Noise Bit. (check this bit to see whether mouse has moved)

$10D) $FB-$FE (251-254). I am not sure these were "reserved" for programmers as much as they were just not utilized by the CBM programmers.

$10E) Black
White
Red
Cyan (Light Blue-Green)
Purple
Green
Blue
Yellow
Orange
Brown
Light Red
Dark Gray (Gray 1)
Medium Grey (Gray 2)
Light Green
Light Blue
Light Gray (Gray 3)

$10F) 5, from $293-$297 (659-663). The register contents:

$293 6551 Control Register
$294 6551 Command Register
$295-6 6551 User Defined Baud Rate value.
$297 6551 Status Register

$110) ESCOM recently purchased the liquidations of Commodore Amiga. GMT Electronics had earlier purcased the IC fabrication division called Commodore Semiconductor Group (CSG).

$111) One must remember that the 1571 DOS was a descendant of the 1540 DOS, which was in turn a descendant of the earlier dual drive IEEE drives. To make the 1572, Commodore engineers tried to re-introduce the dual drive code that had been removed when Commodore started producing single disk drives. Unfortunately, the re-introduction did not ultimately succeed.

$112) The Commodore B-128 line. Story has it that the B-128 User's Group sued Commodore because they claimed to support the B-128 after CBM had closed down production of the B series. The suit demanded that all materials needed in manufacturing and supporting the machine was to be handed over to the User's Group. This included masks of the ICs, source code for BASIC and DOS, and schematics.

$113) The following bytes would be sent to the printer: 142, 145, 145, 128, 252, 212, 168, 128, 159, 134, 159

$114) 2. The Commodore C65 has stereo output.

$115) The CSG65EC02, running at 3.54 MHz.

$116) Some versions of the prototype C65 are referred to as the Commodore 64DX.

$117) None. This is interesting, as Commodore started with two CPUs per drive (IEEE 8050, etc), went to 1 (1540, etc.), and finally cost reduced the CPU completely out of the drive electronics.

$118) Elmer (Elmer Fudd).

$119) Basic v10.0.

$11A) 2 joystick ports,
1 power supply port,
1 expansion port,
1 serial port,
1 user port,
2 audio ports,
1 RGB video port,
1 RF output port,
1 composite video port,
1 high speed disk drive port,
1 RAM expansion connector (under unit behind cover).

13 ports in all. (12 if you discount the PS plug).

$11B) A cassette port.

$11C) Depending on whether you count the "help" key as a function, there are 7 or 8 physical keys, which provide F1-F14 plus help.

$11D) The Internal DOS in the C65 was based on DOS 2.7, found on the CBM IEEE 8250 Drive. This DOS was adapted to the Commodore 65 by Dennis Jarvis.

$11E) 80x25.

$11F) The systems powers up with a multicolored banner on the upper left portion of the screen. It has 6 lines of decreasing lengths in red, orange, yellow, green, light blue, and purple.

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geoFile

A Dynamic Partner for GEOS Users

by Bruce Thomas

Database. Just saying the word is enough to incite negative reactions in people around you. Sort of like saying Tax Audit in the springtime. While word processing and graphics programs enjoy huge popularity, other productivity programs, like databases, are shunned by a majority of computer users. Maybe it is because people think they don't understand databases, or maybe it's due to the lengthy time it takes to set up a database. Whatever the reason, this article will hopefully take some of the mystery out of using geoFile and show how a database can help organize your life and save time.

A Little History

I have been using GEOS on my C-64 for 9 years. I became interested with the release of geoPublish and the freedom it allowed in laying out pages of text and graphics. The system integration has made me a loyal GEOS user.

I faithfully bought all of the packages as they came out, but found that I really only used geoWrite, geoPublish, and geoPaint regularly. I found the lack of 'if-then' ability in geoCalc a big drawback. GeoFile provided me with an easy method of cataloging my record collection, but this was really the only purpose I could find for it at the time.

My collection of fonts and graphics grew and grew, and when I read about geoPrint (banners, greeting cards, posters), by Roger Lawhorn, I just had to have it. A nifty looking program, called geoLabel, came with geoPrint, but the paper feed mechanism on my Star printer was such that I couldn't find labels to print on. GeoLabel sat while I used another program that had very limited font and graphic options, forcing me to save labels as individual files on disk.

When I got an Epson compatible printer the first thing I did was try geoLabel. Eureka! Great labels the easy GEOS way. Now I needed a way to store my information. GeoFile came to the rescue.

Terms and a Useful Example

GeoFile is what I like to call a *dynamic database*—it doesn't restrict you to your initial layout. Part of the previously mentioned fear of databases comes from the effort required to set up the records and fields initially. No, no. Not vinyl records or grain fields. Records, as in groups of information pertaining to a particular subject. Fields, as in pieces of information in each record.

For a database to be useful everything must be organized in a logical manner. Each entry in the database is a record. Each piece of each record is a field. Each record in the database has the same number of fields in it—even if some of the fields are blank. To make a database useable it has to be organized in a logical manner, making searches for information a relatively easy task.

Let's take a look at a very large database that almost everyone has used—the phone book. When the phonebook was set up, the phone company had to decide on certain parameters, just as you would setting up your database. How many columns on a page? How many characters allowed for surnames? How many for first names. How many in the address field? The phone number being the easiest to determine. Name, Address and Phone Number are each fields in a person's record in the phone book.

Each record must also be presented in the same order. This is decided by your choice of the *sort field* and is very important. In the phone book we use the surname as the sort field. We know our friends by name so that is the logical choice to sort by. In your database you can choose whichever field is appropriate depending on the information you are storing. How useful would your phone book be if the phone number was the sort field? What if each entry in the phone book was in a different order? How would we find anyone?

Being able to retrieve information from your database is critical. If you can't find a particular entry, the database isn't worth anything. Look at the top of each page in the phone book and you have narrowed your search to what is between the headers. The same applies to databases (I think I see fewer furrowed brows and less worried looks).

Creating our first Database File

Just like the phone company, we have to make some decisions prior to setting up our database—or do we? Say we are going to store names and addresses of friends and family. With most databases we must decide how many fields we are going to need. Then we have to decide how many characters in each field (why did I get a computer if I have to count the length of names and addresses?). These are reasons people don't like *static databases*. Once you set your fields and sizes they may as well be set in stone. GeoFile, being a dynamic database, is much easier to work with.

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Boot GEOS and activate geoFile. Choose 'Create New Document' and enter 'AddressBook' as a name. Now you will be presented with the Form Page and you can setup your fields the easy GEOS way—point and click. You don't have to decide how many fields or how many characters at this time.

For starters, we will create fields for last name, first name, address, city, state/prov, country, and zip/postalcode. Set the last name field as your sort field (see Chapter 4 of the manual for creating and naming fields and setting the sort field). You will notice that you can place the fields anywhere on the screen (each record can be as big as an 8.5 by 11 inch page of paper). GeoFile can hold up to 64 fields in each record and up to 3000 records in each file. You could store everything you know about each of your friends and acquaintances here and not run out of room. Fields can also be designated as text, number, or comment by highlighting the field and choosing the 'type' menu in 'Form Design' mode.

Entering your Friends & Family

When your form is laid out the way you want, it is time to enter some information. Choose 'Data Entry' under the 'Options' menu and start typing in some names and addresses (use real friends and this will be a good start), we will need at least 10. For our demonstration make one of the entries this one (your long-lost Uncle):

Johnson

James

115 Nobody Home Lane

Saskatoon

Saskatchewan

Canada

R3G 5Y6

Yes, completely fictitious and no resemblance to any person living or dead is intended. You may find that you have to adjust some of your fields to fit this in. While this can be fatal with a static database (especially if you have entered 30 or 40 friends already) it is not a problem with a dynamic database. Go back to the form design page and point and click to resize as required.

OK, we have entered at least ten names and addresses. What about phone numbers? You know what to do. Forms Design and Point and Click to add a new field. This is much easier than starting from scratch again with a Static Database. Enter Uncle James' Phone Number as 436-8913.

If you wish to look through your Address Book you may do so by clicking on either of the two arrows at the top of the page. These will scan forwards or backwards through your file and present your data to you, sorted according to your chosen sort field. Don't like the way it looks? Go back and choose a different sort field or re-arrange the fields on the page.

You can also create up to 15 different layouts by choosing 'change layout' in the 'file' menu (see Pg 4-13 in the manual). These sub-layouts allow you to view selected portions of the main database and allow for many printout variations.

Finding Saska-where?

Exactly. This is where the search capabilities are required. You know your long lost uncle moved to some place that sounds funny and starts with an 'S' but you can't remember where. Remember our phone book and the headers at the top of each page? GeoFile can narrow your search in this manner as well.

Enter a Search form by choosing 'create search form' in the 'Form' menu and enter 'S*' in the 'State/Prov' field. Click on OK at the top of the page. Now click on either of the two Face Icons at the top of the page (these are not identified in any of the pictures in the manual and only function after you create a search form). The left facing one will search back through your data, the right facing searches ahead, and both will wrap around at the end of the file. If no match is found geoFile informs you with a beep and redraws the entry you were looking at prior to searching.

Once an entry is found that matches your search criteria geoFile stops and shows it to you (just like the phone book). If it is South Dakota instead of Saskatchewan just click on the face again. Continue clicking until you find your long lost uncle's address.

Maybe you remembered his name was Johnson. Or maybe it was Johnston, or Johnstone, Johnsen, or Johnsson. Enter Joh* as your search criteria and any matching records will be recalled. Friends whose name starts with 'M' and ends with 'n' can be found by entering 'M*n' on your search form.

Multiple Searches & Conditionals

Now we want to do something else with our search. Back to the search form and enter 4* in the phone number field. Click OK. Click the left arrow to get off Uncle James' entry and then click the Left Face. Depending on who else is in your database you should end up looking at Uncle James again. This search was for someone in a place starting with 'S' (I didn't say delete that) whose phone number starts with a 4.

So far, our searches have used geoFile Wild Cards. The asterisk '*' means substitute any number of characters here. The question mark '?' means substitute one character here. One other wild card is the exclamation mark '!'. This lets geoFile search for asterisks (!*), question marks (!?), and even exclamation marks (!!) if you enter it into a search form. As you noticed, you can search for items in any or all of your fields.

GeoFile also supports conditional searches. If you have entered a field for year of birth you could search for '<1979' to find who people who are over 18. Options include greater than '>', less than '<', less than or equal to '<=', greater than or equal to '>=' and not equal '<>'. These can also be combined with And '&' or Or '%'. Say you want to find all bowlers whose best score is greater than 180 and less than 250: enter '>180&<250' in top score field on your search form. The possibilities are limitless.

The items you search for can be utilized in many ways. You can choose to create Text or geoMerge scraps of all your forms, or just the ones you searched for. GeoFile also has terrific 'Search & Replace' and printing options.

Integrating geoFile

This is the reason I still use GEOS—the integrated nature of all the applications. GeoLabel gave me reason to set up an addressbook file with geoFile. My address book contains fields for Christmas Cards, Family Newsletters, and the Computer Club. When it is time to do a mailing for any of these items I just search the database and create a Merge Scrap of the searched for items. This Merge Scrap can then be easily loaded into geoLabel and I have great looking labels in no time flat. Lots of Font selection, Graphic where I want it, and no need for hundreds of label files with one address in each.

Each user will have a different reason to use geoFile: from cataloging records (yes, vinyl ones this time), to crops planted in that field by the old barn, to documenting how many Steven King novels you own. Once you start using a database you will wonder how you got along without one.

The next time you pick up your phone book and look up a number, remember that you are using a database. You are probably pretty good at it, too. GeoFile, with its dynamic personality and thorough search capabilities, is a great computerized database to work with. You also might find it helps you keep all of your records organized in case that tax auditor comes around in the spring.

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Commodore's Main Distributor

First
in a series
of three articles
by
K. Dale Sidebottom

Part 1

For the Commodore community, 1996 was a year of delight and dismay. The delight, of course, was the anticipated release of the SuperCPU, but we were dismayed to discover how vulnerable we are. When CBM left us, most Commodore users shrugged and murmured, "Who needs them." But as CMD's production lagged behind schedule, I heard serious users voicing grave concern. What happens if CMD fails? If they leave us, who will we turn to for support?

It occured to me that we might try putting the shoe on the other foot! Imagine coming home every night, knowing that your livelihood depends upon doing business with stubborn computer "nuts" like us... we who daily declare our independence by defying the currents of popular computer wisdom. Wouldn't that send you into a sound slumber!

Increasingly, I came to believe that CMD depends upon us as much as we depend upon them. We are together linked in a kind of symbiotic relationship. If both of us do our jobs well, then everybody wins! If either of us, not both, but if just one of us fails to fulfill our responsibilities, then everyone loses!

This realization drove me to begin writing and to explore the relationship between CMD and the Commodore community, particularly in light of recent revolutionary developments. After I had finished a series of three articles, I called CMD to ask their advice. With so many user newsletters in the land, who might be willing to publish these in order that I might reach the widest audience. I was amazed to hear them say, "We will."

> Commodore users seem to fall into two groups-- those who love the Commodore as CBM left it, and those who probably would have left it if not for CMD.
> —K.D.S.—

Why the surprise? I have always felt that CW tended to be rather technical, while this series clearly targets the heart, more than the head. Yes, these articles contain useful information, but more important to me is the introduction of new ideas.

Meanwhile, I want to assure you that CMD has had no direct influence on this discourse. If you listen closely, you will hear the spirit of stubborn independence throughout these pages. That will be your best validation of its authenticity.

I want to give special thanks to CW for bringing this series to you. Most of all, I want to thank you for being there. It is your support, really, that makes all the excitment possible, and for that I am grateful. Thanks for listening!

My Commodore reminds me of Tombstone, Arizona, in the days of Wyatt Earp; **it's just too tough to die!** CBM tried to kill it four or five times, but high demand always forced them to put it back into production, until the day they mismanaged to kill themselves.

Meanwhile, we have seen 16-bit and 32-bit computers come and go in popularity. Now the Pentium chip is all the rage, allowing 64-bit addressing at 100 megahertz, while our beloved 8-bitter still strolls along at 1 or 2 megahertz (unless you are the lucky owner of a SuperCPU)! In spite of all this, Commodore enthusiasts are still hanging tough! Or are they?

Let's be honest! Our ranks seem thinner than they were. Many Commodore groups that were active five years ago are now history. Companies which sold our products for years no longer

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Author's Note

Mark Fellows created JiffyDOS and began to market it in 1986 as Fellows, Inc. The following year, he joined with Charles A. Christianson to found Creative Micro Designs, Inc. (CMD) in order to expand and to produce new products.

Commodore once referred to Commodore Business Machines, Inc. (CBM). Since they went bankrupt, the word "Commodore," as used in this article, never refers to the Commodore business. It always refers to the Commodore 64 and 128 in their various forms or to the community of Commodore enthusiasts throughout America and around the world.

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supply us. Repair parts are becoming more and more difficult to locate. Are you wondering how we will continue when the parts disappear forever?

CMD has just finished the SuperCPU for the 64. Yet, at the moment of our greatest triumph, we seem to be uncomfortably "on edge." I am increasingly concerned about the gloom and doom creeping into our Comm-adoring community. Yet, the signs are unmistakeable.

In a recent issue [#15] of ***Commodore World***, CMD was feeling the heat. The issue was late and Charlie Christianson, CMD's co-founder, sought to reassure subscribers by directly addressing their concerns.

You've probably even begun thinking of worst case scenarios. Is it that they are going to stiff me like so many previous Commodore magazines have? Is it that they just don't care? Are they getting out of the Commodore market?...[We] can truthfully answer NO to all of [these questions]!"

Can you blame us for being nervous? Many of us feel like CBM abandoned us. Berkeley Softworks, creators of GEOS, treated us no better. It seems that we no sooner help make a company prosperous than they move on to bigger markets! By this theory, the more successful CMD becomes, the quicker they'll leave us. Who can blame us for feeling a little bit paranoid!

Charlie's "From the Editor" speaks to this point, as well. *"We have about a half a dozen people who have dedicated the last nine years of their life to the survival of our beloved C-64 and C-128 platform. So without laying it on too thick, let me simply say that our subscribers need never question our commitment to Commodore World!"*

Meanwhile, some 64-users were getting upset by continual delays on the release of the SuperCPU. I remember reading an article by Pete Baker first published in COMM-LINK[1]. He had sent in a $50 deposit in January toward the purchase of a 64-accelerator expected in April. He was still waiting in June. He described his frustration of waiting for months without a satisfactory explanation from CMD.

"The thing is, CMD is about the last company providing any hardware to the 64/128 user, so we want to support their efforts by buying their stuff. I can say that I've tried to do so, only to be put off by CMD for my trouble."

I empathize with him because I know many Commodore enthusiasts questioned why a 64-accelerator first targeted for February was not shipped until August! This can test anyone's patience. But I also feel a great deal of empathy for CMD!

Imagine the whole Commodore world holding its breath, waiting for YOU to make good on a promise! The pressure would be ENORMOUS! And this isn't just any promise either. This one requires you to resolve some of the most difficult technological challenges that anybody in Commodore has ever mastered!

I remember speaking about this to Charlie back in 1992 when I was preparing an article for ***geoVISION*** magazine. I asked him then about the possibility of a CMD "turbo cartridge." He answered that current cartridges all had compatibility problems. CMD would never create such a an accelerator unless it could be made largely compatible with existing hardware and software. He left me with the impression that such a task would be next to impossible and that it was unlikely they would ever pursue it.

Fast forward four years, and look around. The impossible is about to happen! CMD is so very close and, yet, so far.

> Too often we have seen people leave their Commodores... because they could no longer accept the uncertainties... **These uncertainties must end!!!**

As Charlie explained to me in July, the SuperCPU's were out on the dock ready to be shipped on three different occasions only to be pulled back in for further modification. All ordered SuperCPU's were, at that moment, sitting in the warehouse ready to go. Almost! Only one thing was missing. Mark Fellows, CMD's other founder, was barricaded in his labratory, laboring hour after endless hour to perfect the ROM chip or "brain" needed to complete it!

Now that the SuperCPU is an accomplished fact, the crisis is over and we can all breathe a sigh of relief. My SuperCPU is plugged into my 64 and GEOS glides like "greased lightning." It seems like *"God's in his heaven, all's right with the world,"* at least, until next time.

Today I find it hard to believe that, for nearly half its existence, I hardly heard of CMD. Early on, I became a geoNut. As I would tell my friends, "If GEOS doesn't do it, neither do I!" Since GEOS doesn't need JiffyDOS, I had no contact with CMD.

Everything changed in 1991. CMD introduced the RAMLink and I was hooked! I was so impressed by their revolutionary REU that I wrote an article in 1992 which appeared in the Premier [Jan/93] issue of ***geoVISION*** magazine. My faith in the magazine soured when it only survived three issues, but my perceptions on CMD proved prophetic.

If you have a copy of this issue in your archives, turn to page 6 and find a feature story entitled, "Commentary on 1992: CMD Takes Center Stage."

"By far the most exciting development ...in 1992 was the ascendency of Creative Micro Designs (CMD). This was the year that they pushed the HardDrive, mastered the RAMLink, and introduced the new FD drives.

"Once upon a time we depended upon CBM for hardware and Berkeley for software... But who do you turn to when you want to 'push the envelope?' When you want to expand the limits of your computing world, who do you call? I usually call CMD."

Since that time, CMD has become **Commodore's Main Distributor.** As a computer friend expressed recently, "It seems like all the other suppliers are dumping what they have on their shelves and getting out of the Commodore business. CMD is about the only place where I can buy what I need."

I pointed out that the reason they continue to distribute while others "close out" is simple. What they cannot purchase from their suppliers, they produce! This is especially true in the area of Commodore compatible hardware.

Take a moment to consider what our Commodore world was like when CBM left us; that is when they stopped developing new products for our 64's. Then think about what we have now.

For instance, when CBM left us, I had a 1351 mouse with a roller that was never quite round. It was so susceptible to dirt and grime that I had to clean it continually. Now I use a three-button mouse from CMD that is so "smart," it can tell time! It works great and keeps clean!

When CBM left us, we had a RAM expansion with a maximum storage capacity of 512 Kilobytes (K), or half a Megabyte (MB). Today, by using the RAMLink, we can have up to 16 MB.

When CBM left, our fastest modem was 2400 bps (bauds per second). Now several sources provide modems exceeding that. CMD's offering is the Turbo232 cartridge which combined with the SuperCPU allows transmission rates of 230,000 bps.

When CBM left us, the largest capacity drive was the 1581, a 3 1/2" disk drive. It stores 800K or about 0.8 MB.

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Unfortunately, CBM didn't make many of them; so there weren't enough to go around. CMD responded by producing the FD-2000 with a capacity of 1.6 MB. This drive doubles the memory capacity available on the 1581, much as the 1571 doubled the capacity of the 1541 drive.

By far the most dramatic difference between then and now is the maximum accessible memory on a single drive. We have reviewed the 1581 drive and its 800K (0.8 MB) capacity. That was all we had.

Since then, several hard drives have been adapted for the Commodore, but CMD went even further. They created an innovation called "CMD native mode" partitions which can vary in size from 256 blocks (64KB) to 16MB! A Commodore can recognize as many as 254 of these partitions.

Now imagine formatting your hard drive so that you can create 254 native mode partitions, each of which is 16MB in size. Your Commodore 64/128 can now access up to 4.4 gigabytes (GB) on a single drive!

If you are like me, you are asking, "What's a gigabyte?"

Simply put, a gigabyte is approximately a billion bytes of memory. For instance, my LUCKY computer club[2] is justly proud of its library which has about 1300 1541 disks. Yet, our library contains less than one-fourth of a gigabyte of data. We could increase it by a factor of twenty, and it could still fit onto one Commodore-compatible hard drive!

Comparing again the old to the new, CBM's 1581 left us with a maximum drive capacity equal to *five* 1541 disks. Through CMD native mode partitions on a hard drive, we can now store up to 4.4 gigabytes, which is equal to the combined storage of 27,500 1541 disks! Now *that* is what I call *growth*![3]

So far we have only discussed hardware. Check out a CMD ad from 1991 or 1992, and you'll find little software is offered. Today their advertisements read like "Who's Who in Commodore Software!"

They have worked diligently to bring all the commercially viable software [*the really good stuff*] under one roof. For instance, GEOS users are grateful that CMD could negotiate with Berkeley to keep GEOS alive. Thus, a company which was once principally hardware-oriented now offers the best Commodore software, as well.

How about communications? CMD publishes ***Commodore World*** which is the only national glossy print magazine we have. They also have taken over the job of SYSOP on GEnie.

Last, but not least, they offer support for those who need their computer equipment repaired. They may cost a little more, but they know as much about the inside of your Commodore as any company in America. When all else fails, send it to CMD!

Someone will likely conclude that this article was written to endorse CMD. If that opinion encourages anyone to increase their patronage, well and good; but it misses the point!

Since I became a Commodore user in 1982, I have never seen our community take such "body blows" as it has suffered in the last several years. We have seen Commodore magazines die that shouldn't have. We suffered the death of a parent (CBM). We watched the heirs, Escom AG of Germany, distain the the 8-bit technology which we hold so dearly and they hold so casually! Such disappointments cut deeply.

Thankfully, even the darkest clouds can carry a silver lining. For instance, LOADSTAR still produces a super disk magazine. GEOS users appreciate Maurice Randall, whose geoprogramming is a godsend. I know you can think of others.

Sing a song of Commodore,
Filled full of hearty praise,
Then toast the silly seers who said
Its seen the final days.
Let those who love the 64
Enjoy its lengthy run,
For in these days of Commodore
The best is yet to come!
—K.D.S.—

Nevertheless, the sad events of the recent past have spawned a sense of calamity and apprehension within many, and *these are not the building blocks of a strong computing family!* Too often we have seen people leave their Commodores, not because they were excited by another platform, but because they could no longer accept the uncertainties of this one!

These uncertainties must end!!! A clear message must echo in ever corner of our computer world that, with the development of the SuperCPU, the Commodore has turned an important corner. The pendulum which has been swinging the wrong way for years is now moving in our direction. The kind of support that we once sought from CBM can now be found at CMD!

There is a story close to home that illustrates my point. My son-in-law, Roger Lawhorn, is a programmer. He has written programs like GEOSIDPLAYER and COLOR GeoPrint which are probably used in every "Commodore" country on the planet. When he began programming in MS-DOS for financial reasons, he never lost his love for Commodore.

Recently, when I demonstrated my SuperCPU for him, he wanted to begin Commodore programming immediately! He soon sold his 486 computer so he could purchase a SuperCPU and a used CMD HardDrive. As a programmer, he can see all kinds of new possibilities!

We still need to remember that the people at CMD are *people* and, therefore, not perfect. Yes, they could have done a better job of explaining to us why there were so many delays on the SuperCPU. But Pete Baker will be the first to tell you that it was definitely worth the wait!

Let's also give credit where credit is due. We know our Commodores are *too tough to die*. CMD appears to have the savvy to share that vision, as well as the wisdom to capitalize on it. For the last nine years, they have intelligently sought to fill the gaps and plug the holes in the good ship *Commodore*, and we should thank them.

You should also recognize that with the completion of the SuperCPU, CMD has really "come of age!" You'll never get the modest folks of East Longmeadow to admit it, but they have proven themselves capable of doing anything that they absolutely, resolutely set their minds to accomplishing!

What can we expect in the future? If my perceptions of CMD in 1992 were accurate, perhaps you will allow me to share my perceptions for 1996. I see a company that is generally pleased with their position in the industry and content to continue their current direction for the foreseeable future. If the bad news is that CMD may, indeed, be a company "on the move," the good news is that they plan to take us right along with them. It promises to be an extraordinary ride!

Now that the SuperCPU's are flying out the door, what might CMD be planning for an encore? Read all about it in part 2, "Commodore's Major Developer."

[1]COMM-LINK is the newsletter for HACC, Hub Area Commodore Club. Contact them through Rita Smith, 743 Jewel Ave., Yuba City CA 95991.

[2]LUCKY is the Louisville Users of Commodore of KentuckY, Inc., P.O. Box 9551, Louisville KY 40209-0551. E-Mail them at 3050@iglou.com.

[3]Hard drives exceeding 2GB must be specially ordered from CMD, P. O. Box 646, East Longmeadow MA 01028, or you can call 1-800-638-3263.

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Graphic Interpretation

by Paul Sullivan

GEOS BOOT DISKS MADE EASY

All too many times you have probably heard the old proverb that "there is safety in numbers". Yet for as antiquated as it may be, that wisdom still holds true today—for the GEOS user's boot disks!

It goes without saying that your Graphic Environment Operating System completely depends on the perfect health of your system disks' boot files. Conventional file copiers cannot produce working duplicates of the boot files because even if the disk's copy protection is broken, the kernel file must reside on the backup disk in the exact position as it did on the original disk. GEOS uses track and sector loading procedures rather than file oriented loading. With the ever-increasing number of software and hardware products for the GEOS user comes greater demand on the user's boot disks—thus the need for a program to back these disks up. I would like to relate how I had to follow what could be called the "Maverick maze," and how Creative Micro Designs' geoMakeBoot opened the door to effective, time efficient boot disk archiving.

I quickly learned the value of my boot disks, for within a month after purchasing my original Commodore 64, the GEOS 1.3 system disk became magnetized because I foolishly placed them too near a huge supply of static electricity—namely, the front of my monitor. The moment that I realized what happened (when mysterious

looking characters appeared on a printout instead of the report I needed) I quickly went and purchased GEOS 2.0, and searched diligently for a boot disk backup creator. QuantumLink offered one such file for 1581 users, but it meant nothing to me as I did not yet own a 1581.

I then discovered the Maverick, a complex utility system by Kracker Jax software. Though it boasted of such tools as sector map editors and nybblers, the primary feature I desired was the "Geo-boot" from its GEOS tool kit. Initially, my needs were simple: I only wanted GEOS 64 backups for my 1541s. But, like any aspiring Commodore user, I soon upgraded my system to a C-128, GEOS 128, two 1581's and a 1750 RAM expander.

The Maverick's limitations and my limited patience began to show once I tried to make backups of the GEOS 128 system disks for my 1581s. The C-128's capability to autoboot disks was not working on the 1581 Maverick boot disk. When testing the new boot disk immediately after creating it, a screen prompt appeared that asked for a disk with DeskTop 2.0 or higher.

Once DeskTop and the input files were added to the new disk, the system would freeze during the boot process. Disk validation didn't work, removing the much needed auto exec files Autoclock and Quikstash didn't work, and the Maverick manual only mentions that its Track and Sector Editor should be used to allocate Track 1 Sector 0 after validating. This was extremely confusing for me, and I never did figure out exactly how the Track and Sector Editor was supposed to allocate anything, much less specific tracks and sectors.

After hours of trying, I did manage to figure out how to make the Maverick backup complete the boot process; no files could be copied to the disk space right after the boot file; that is, DeskTop 128 Page 1, Position 2. That was no problem until I copied a file to the disk—because that needed open space would always be the first space copied to due to its location on the DeskTop. (GEOS always copies

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files to open areas on DeskTop pages in numerical order: first on page 1openings, then page 2, etc.) Unless that copied file was moved to another space, the boot disk would not function properly. Worse yet, the most recent edition of Maverick that I have seen, version 5, makes no mention of CMD's HD series hard drives or RAMLink in its user manual, calling into question its compatibility with the latest C-64/128 hardware.

Here is where geoMakeBoot made life much easier for me, and can for you! Compatibility with all GEOS supported drives is one outstanding feature of this utility. The established 1541 and 1541-II, 1571 and 1581 drives are a given, but geoMakeBoot surpasses the Maverick utility by its ability to support the CMD RamDrives and Hard Drives. Given its own partition, GEOS can now boot in a fraction of the time without using any floppy disks at all. Another important feature: geoMakeBoot is very user-friendly.

Several brief steps will have your backup boot disk ready to go.

First, power up your system and format the disk that you wish to boot from. If you own a hard drive or RAMLink, just choose an existing 1581 partition—no need to format. Sorry, 1764 and 1750 RAM expanders don't count, as they lack a backup power supply.

The second step is to copy the GEOS/GEOS 128 file from geoMakeBoot to the newly formatted disk or partition, followed by DeskTop/DeskTop 128, Configure 64/128 (or RamDrive-compatible configure) and your input and printer drivers. Don't forget any auto-exec files too!

Next, copy geoMakeBoot 64 or 128 to your new boot disk or partition, then place that disk in the drive that you will be booting from.

Finally, open that drive with the new disk in it, and double-click the geoMakeBoot file icon. The screen will clear briefly, and when Desktop reappears, the disk will contain a file called geoBoot/geoBoot 128. You are now ready to roll.

Much has been said in this article about geoMakeBoot's hard drive and Ram drive compatibility. It should be noted, however, that even the most basic C-64/128 systems can utilize geoMakeBoot. Its system requirements are, simply, GEOS 64/128 version 2.0, a 1541 or 1571 drive, and a mouse or joystick.

Some pointers: You have heard the old adage, "an ounce of prevention is worth a pound of cure." CMD gives several ounces of prevention in geoMakeBoot's instructions that will help keep you from having to troubleshoot pounds of problems after the backup process is complete: remember to create your boot disk on the device that you intend to boot from, and have your system configured exactly as it will be when booting GEOS. GeoMakeBoot will, in short, keep your GEOS software up and running well into the next millennia! Until next issue, happy archiving!

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DemoMania

by Sherry Freedline

1996—THE BEST OF THE BEST

The snow is falling and soon we'll bid adios to 1996. In fact, I bet by the time you read this, we'll be well into the new year. However, 1996 won't soon be forgotten. It was an extremely good year for the Commodore 64, especially within the Demo Scene. In 1996, we were treated to quite a variety of demos and even saw a few people return to the Demo fold, with the formation of an all new group with a lot of talent, ambition, and potential.

Now, let me introduce you to the first ever *Zig Awards*, created and judged solely by me (an extremely avid demo fan). Please know that a lot of thought has gone into these results, but remember they are my personal opinions and not that of my employer's (how many times have you heard that in 1996?). On with the awards....

Best New Demo Group

The Hot New 1996 Demo Group award easily goes out to Millenium; consisting of Roy Batty, Waveform, Fungus, and new member, Suraklin. Ambition, talent, and Commodore Loyalty are three virtues that easily come to mind after viewing Millennium, their Mega-Demo introduction to the Scene. Roy Batty, Waveform, and Suraklin are no strangers to the scene.

Most of you will easily remember Roy Batty for Tears CE95, possibly the most memorable of all demos to be released within 1995. Roy Batty is also well known for his contributions to *Loadstar Magazine* in the form of music and graphics. Roy is one of the most multi-talented Demo Sceners around. His talents bring together the skills of three different individuals—music, graphics, and most importantly, coding!

Next up is Waveform, previously known for his "Waveness" releases. Waveform is the master behind the ingenious vector code of "Millennium." His coding is unique, innovative, and even quite artistic.

Fungus is best known for his coding skills. He's a relative newbie to the scene, lending this new group with his Commodore knowledge, dedication, and ambition. He's off to a running start and definitely worthy of membership in Millennium.

Suraklin is also relatively new to the Scene. He has released four independent demos during 1996, and is also the newest member of the Millenium group. Suraklin is very talented in the field of graphics and coding, but most importantly, he's ambitious. All four of these individuals possess a passion for coding, which for demo enthusiasts equals the promise of a number of releases both by the individuals of Millenium and Millenium as a group.

Best Demo

The Best 1996 Demo award easily goes out to Eternal by Electron. Electron's only currently active member is Dokken—a mega-talent within today's demo scene. Unfortunately, Eternal was Electron's only 1996 release. However, after viewing Eternal, I can easily see *why* it's their only release of the year. Dokken created every single pixel and sound contained within this incredible multi-page demo. Eternal contains incredible graphics, hot music, and awesome routines. Coupled with the fact that this was all the creation of one single individual, it well deserves the Best Demo of 1996 award. Dokken is now enjoying a much-needed rest, but I hope that 1997 sees another amazing masterpiece from this mega-talented artisan.

Best Demo Group of 1996

The Best 1996 Demo Group award is a tie between Style and Forces of Evil. Style is a well-known constant within the scene. They continually bring new quality releases to the Commodore Community. Along with their demo releases, they also provide us with new demo tools and NTSC-fixed demos from the PAL world. Style is definitely dedicated to their goal of prolonging the Demo Scene within the NTSC environment. Without their NTSC-fixing skills, the NTSC citizens would never have been able to enjoy the privilege of viewing four PAL releases in 1996.

Forces of Evil, more commonly known as FOE, is also deserving of this award due to the number and quality of their demo releases in 1996. FOE releases are always innovative and entertaining. FOE is also famous for their Coder's World demo tutorials which help promote the demo scene by introducing the world to the art of demo coding. Unfortunately, Coder's World is no longer in production. I'll always remember FOE as the group which first introduced me to the infamous *plasma-type* page found in a lot of the 1996 demos. Thanks FOE!

Best 1996 Demo Scene Supporter

The Best 1996 Demo Supporter Award goes out to the staff of "Driven." The Driven crew regularly supplies the Scene, both NTSC and PAL, with all the news of the Demo World. This is certainly no easy task. An amazing number of individuals regularly contribute articles, graphics, and music to Driven's electronic 'zine. While the regular contributors deserve a huge thank-you, it's Elwix and Coolhand who make the whole magazine a reality by editing the articles and converting all the text, graphics, and music into an enjoyable Demo Magazine. I'd especially like to thank Coolhand for all his many contributions in 1996—for the editing hours, for the many Thursday night NTSC Demo Conference hours, for his constant inspiration to continue writing for and about the Demo Scene, and last but not least, for his tireless dedication to keeping this Demo Scene alive and kicking.

Year in Review

1996 will long be remembered for the first-of-its-kind demo competition, known as the 4k Demo Competition. While not everyone thought of it as a success, it brought the scene together in a fun way, resulted in 17 releases, and generally brought

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the Commodore Scene to life. I hope we'll see a similar competition in 1997. Last year should also go down in history due to the first ever world-wide coverage of the demo scene here in Commodore World magazine. It is a pleasure to be able to write about the Commodore medium that I've loved for so many years. I hope that this column, which I've just recently been told will be a regular feature of Commodore World Magazine, has introduced many Commodore users to the unique world of Commodore Demos. In my opinion, no other Commodore medium captures the amazing power of this little brown box's music, graphics, and programming capabilities like the Commodore Demo.

1996 will also be remembered for the introduction of Creative Micro Design's Super CPU. The SuperCPU is an asset to all facets of the Commodore Community, not just the Demo Scene. In 1997, I hope we'll see the introduction of programs written explicitly for this powerful peripheral. Just imagine the power this can provide a talented demo coder! I hope someone has the time, the knowledge, and the will power to show us a SuperCPU explicit demo. I must admit, I'm quite anxious to see how demo artisans make use of all this added power. I'm sure it will be well worth the wait!

1996 was the year that the Commodore Scene (demo-oriented and otherwise) virtually exploded onto the Internet. A large number of Demo Groups entered the Internet Arena with dazzling home pages featuring their creations. Coolhand, of Driven fame, also maintains a very popular demo site where you can find all the issues of Driven, all the hot new demo releases, all the e-mail addresses of the Demo Sceners and a wealth of demo-related information. (I'd love to know Coolhand's secret to finding time for all his many activities.) Not only has the Demo Scene entered the Internet World, but the Commodore Community is now very well represented on the Net. Jim Brain maintains the master of all Commodore sites, providing CaBooM!—a database of all Commodore-related sites available on the Internet, the Commodore FAQ, and almost anything Commodore-related that you'd ever need.

Another up-and-coming Commodore hit on the Net is the Commodore Ring—a circle of Commodore Sites where each site provides a special link to whisks users away to the next member of the Ring. This has been heard time and time again, but it has to be said again within this tribute to 1996...Commodore is Alive—the Internet & the IRC (#c-64 & Thursday's on #c64ntsc-NTSC Demo Conference Night) are living proof!

Well that pretty much wraps up 1996. Personally, I'd like to thank all the demo artisans for making 1996 a truly awesome demo year. Hmmm...perhaps historians will mark 1996 up as "The Year of the Commodore Demo?" Probably not, but in my book, that's how it will best be remembered. 1996 has set quite a high precedence for 1997. Somehow, although I know it will be tough, I hope 1997 manages to outdo 1996.

Etch-A-Style by Style

Etch-A-Style was released in September. Due to the high number of releases, we are a little behind the times as far as new demo reviews go. Etch-A-Style is unique because it's more than just a demonstration; it is fully interactive!

Etch-A-Style is, of course, a Commodore 64 version of the infamous Etch-A-Sketch toy. However, it's better because you never have to worry about it breaking and having all that powder released all over your house. As the program states, Etch-A-Style started out as an experiment, but turned out to be a fun demo for all involved—even the viewers! The demo's music is by Deathlok, the character set and sketch pad are the result of PK, the sketches were drawn by PK, The Wiz, Decomp, and Elwix, and the Etch-A-Style code comes from the mind of The Wiz.

The demo begins with the familiar Etch-A-Sketch toy displayed on the screen accompanied by the music of Deathlok. Viewers are treated to a variety of Etch-A-Sketch drawings created by the cast and crew of Style. You actually get to watch as the masterpieces are drawn on the Etch-A-Sketch screen. Some of the drawings are truly incredible. Personally, I've always found it rather difficult to compose a drawing with an Etch-A-Sketch. However, as you can see for yourself, PK makes it look quite easy.

Once you've enjoyed the Style Etch-A-Style creations, you can begin designing your very own Etch-A-Sketch masterpieces. If you have any problems using the interface, help is only a spacebar press away. By pressing the spacebar, you'll activate the help text scroller. Pictures are drawn by pressing the right and left cursor keys, the Commodore key, and the shift keys. Two features make the Commodore Etch-A-Style version better than the original Etch-A-Sketch: the ability to save your drawings and the ability to replay the drawing of your picture. Come to think of it, there's yet a third unique feature not found on the original—the ability to undo undesirable lines by pressing the "U" key. You can even clear your picture entirely from the screen by pressing the "C" key. The "C" key is bound to evoke a few chuckles as your Commodore 64 shakes your Etch-A-Style drawing pad to clear its screen. Once you're happy with your finished picture, you can save it to disk for later retrieval. Saved pictures can later be loaded and enjoyed in the same manner as the original creations of Style.

Style has left no stone unturned with it's Etch-A-Style creation. Once you've seen the group's creations a few times, you may not wish to view their masterpieces every time you load the demo. You can head straight to the drawing pad simply by pressing the Run/Stop key. The text contained within the program is suitable for viewers of all ages. Etch-A-Style is a demo sure to be enjoyed by young and old alike. Thanks for the fun, Style!!!

The Demos of 1996

1996 NTSC Demo Releases
Beyond Force
Party Trap
Bone Stripper
Bone Stripper,s Return
Carcass
Carnivorous!
SatanClaws
Death Lords of Chaos (DLOC)
Drip

Electron
Eternal

From the Ashes (FTA)
Template Magic
Template Tutorial

Forces of Evil
7 Years
CAT
CAT97
Digital Magic
Redrum
S.E.T.

Millenium
First (Suraklin)
Homport (Roy Batty)
Millennium
MXR (Fungus)
Not Done (Suraklin)
Toasted Brain Cells (Suraklin)
Victims (Suraklin)

Omni
Dreamland
Tidal Forces

Oxyron
Dawnfall

PSW
Wevealed

RPG
Subliminal
Sunset Trail
Stephen Judd
Polygonamy
Storm

Alive
Style

Animusic Pack (Ascraeus) - NTSC
Fixed
Etch-A-Style
Experience 3 (Fatum) - NTSC Fixed
Snowflake
Temple of Boom
Tribe (Therapy) - NTSC Fixed
Wix Bouncer V5.0A (Elwix)
X-96 Graphics Winners - NTSC Fixed
Zone 2

Hatework
Inferior
Not Dead!
Strive

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Carrier Detect

By Gaelyne R. Gasson

BATTLE OF THE ASCII'S

Not long after I'd begun exploring the world of telecomms, I was participating in a recipe group on one BBS. We were each expected to upload our favorite recipes in a special area on the BBS. I'd learned how to transfer files, but I hadn't had experience at sharing text files with those using other computer platforms. I thought it would be a matter of just uploading the file and that would be it... boy was I wrong.

When CBM designed their Commodore 8bit line, they opted to go their own way instead of using what had become the standard "character set" for computers. While other computer manufacturers were using ASCII (American Standard Code for Information Interchange), Commodore used a slightly different set of codes referred to in the C64 Programmers Reference Guide as "Commodore ASCII". In general use, most people refer to this as "PETASCII." When looking at a true ASCII file with the C64/128, it appears that the upper and lower case letters have their places swapped.

When I uploaded my PETASCII file to the MS-DOS BBS, it ended up looking like gibberish online, so I took a guess that I'd have to translate the file somehow. My guess was correct, but the way I went about things is embarrassing today. If I'd tackled the problem logically, I'd have realized I need only translate something ONCE. What did I do? I converted the file to ASCII using my word processor, and then when I uploaded the file I used Novaterm's transfer translation too. If I had simply done one OR the other it would have come out correctly.

Later, I downloaded recipes that others had uploaded and found that I still had a lot to learn about ASCII text files. I found myself spending far more time reformatting the text than should be necessary, and I knew there had to be an easier way to deal with these files.

Because text files are a large part of my computing experience as a writer, I've learned how to prepare text files to send to other platform computer users and have it arrive there intact. I've also learned how to make use of other platform text files without spending hours reformatting it. These are two separate but inter-related subjects. First we'll tackle the basic differences in text files, then talk about sending files to other computer platforms, and last, how to convert files we've downloaded so they're formatted nicely for our own use.

What's The Difference?

Although ASCII is the standard used on other computer platforms, there's a variation of standards as to the end of line markers, and these affect how the text is formatted. This variation is a hold-over from the days when computers were connected to printer terminals instead of monitors, and was based on what the printer hardware required for the end of line character. Those days are over, but the end of line differences between computers remains. If you've ever downloaded a text file created on a UNIX or Amiga system, you've probably discovered that the text is readable but it looks pretty rough as all the lines appear to run together. Text created with these systems use a linefeed as their end of line marker; when our C64/128 programs don't find any carriage returns, it shows the entire file as one long line of text.

Text created with an MS-DOS computer is usually formatted ok when viewed with a Commodore program, but the end of the line may show a reversed character at the end or beginning of each line. In some programs, this is a reversed "j" character, and in others it may be a reversed back arrow key. MS-DOS text ends with both a carriage return and linefeed. Our programs honor the carriage return character with an automatic linefeed (no special chararacter required), but some don't know what to do with the linefeed character in the file so they display it as if it were text.

To distinguish between the different types of text files, we'll refer to files that end with a linefeed as UNIX files, and those that end with a carriage return and linefeed as MS-DOS files. PETASCII *always* refers to Commodore's unique character code format, and for this article, we'll refer to ASCII files with a carriage return as *ASC-CR* files. This is the preferred format for viewing ASCII files with the C64/128.

Sharing Your Files with the Online World

If you're going to be uploading text files for use on another platform computer, it's best to have the file in the format it will be used in before uploading it. Usually you can simply upload an ASCII file without worrying about the end of line format. The only times when the end of line format need be changed beforehand is if the file is meant to stay online to be read as a text file (not in a message online). Changing the end-of-line (EOL) format is covered later in this article.

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There are many ways to change a PETASCII file to ASCII format. I find it easiest to save the file as ASCII using whatever program I've used to create the text. The Write Stuff and PaperClip III are two word processors that are capable of saving files as ASCII, and there are many others. For geoWrite files you can use a GEOS utility named WrongIsWrite (wrong-is-wr.cvt) to convert the file to ASCII or PETASCII. Bear in mind that any special text formatting such as fonts or bold won't be converted with the file. Novaterm users can use menu options within the term program to translate files before uploading them.

Converting a File While Sending

Dialogue128 and Novaterm both have options that allow you to translate text files during a file transfer. I shy away from using these because I have a faulty memory and tend to forget that I've turned this feature on. Because this feature will translate ANYTHING you download, this is a sure way to have botched downloads for binary type files (programs, graphics, etc.).

Buffer Uploads

Many term programs offer the option of sending text or text files from the buffer, and this is useful for times when you compose a message offline and want to import it into the online systems text editor. For buffer sends, what format the text should be in depends on the term program. If using Novaterm's "File to Modem" option in the buffer menu, the file should be in PETASCII format (the text is sent as if you had typed it from the keyboard). This feature has no relationship with the Novaterm's file transfer translation featurure discussed above.

Other programs, such as Dialogue128 and Desterm allow you to import text into the buffer as either PETASCII or ASCII format. Import the text so it views properly while in the buffer and it will be sent to the BBS or online service correctly.

Also, it's important to realize that before using this feature you must be in a text editor online, as otherwise the online system will assume that you're sending it commands—and this could cause problems.

Reading Files

Sometimes you just want to read a file, but don't want necessarily want to edit it. Most text editors or word processors have a limit to the size file they can handle, but there are a couple utilities that allow you to read files of any size, up to the capacity of your disk drive.

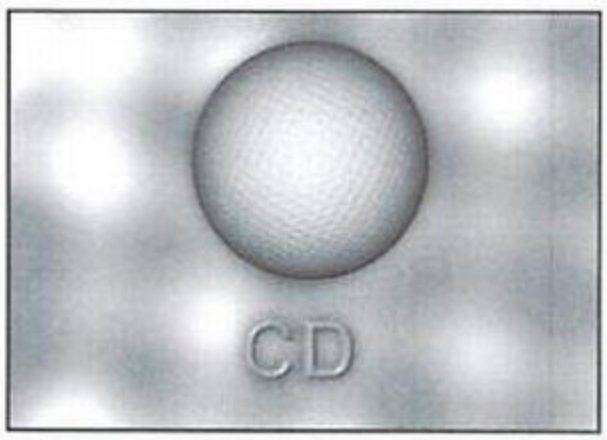
C64 and C128 users can view PETASCII files using a utility in the ACE operating system(ACE15A.SFX through ACE15E.SFX) called "more". The command is:

```
more <filename.txt>
```

C128 users can view text files using Browser (BROWSER2.SFX or BROWSERB.ZIP). The program auto-detects whether a file is ASCII or PETASCII before displaying it, but for UNIX files you'll need to change the display options for the LF (linefeed) character to CR (for carriage return). Browser defaults to stripping (or ignoring) the linefeed character, so MS-DOS files usually display without any adjustments. Browser also alows forward/backward paging through text files and saving an index file so you can page through it faster if you read the file again later.

Converting Text Files

When we download text created on other platform computers, chances are we'll need to convert the end of line format so we can read or print it formatted correctly.



There's a very easy to use utility that converts MS-DOS text files to PETASCII is ASCTOPET, written by Russell Prater. Available in both C64 and C128 versions, this utility also has the ability to split large files into several smaller sized files. Look for ASCTOPET.C64 or ASCTOPET.128.

Zed (ZED007.SFX) for the C128 can set the way the program reads in (or exports) files by first going to the options menu (CTRL-o) and changing the Read and/or Write options so they match the type of file you have or require. The idea is to import the file with the Read option as the file is currently (you may have to guess, or try a few different choices), then save the file with the Write option set for the format you require. The choices are:

ASC-CL	MS-DOS text
ASC-LF	UNIX text
ASC-CR	ASCII-CR text
NONE	No translation (useful for importing PETASCII or exporting text in specific formats).

The ACE operating system (file names given above) has a utility named "tr" that can translate files and control the end of line character. The commands are in the format of:

```
tr -x2y filename >newfilename
```

The x and y in the above command can be replaced by any of the following:

m - MS-DOS
u - UNIX
a - ASC-CR
p - PETASCII

So, to convert an MS-DOS text file to PETASCII, we would use the command:

```
tr -m2p pet.txt >ascii.txt
```

Using BASIC To Change the End of Line Format

You can use a short BASIC program to change how the end of each line is formatted. The following program changes UNIX text files to MS-DOS format. It looks for linefeed characters (chr$(10)) and adds a carriage return (chr$(13)). Replace the file names "unix.txt" and "ms-dos.txt" with the file names you require.

```
10 open2,8,2,"unix.txt":open3
,8,3,"ms-dos.txt,s,w"
20 fori=0tol:get#2,a$:i=st:if
a$=chr$(10)thena$=chr$(10)+ch
r$(13)
30 print a$;:print#3,a$;:next
:close2:close3
```

If you change line 20 to:

```
20 fori=0tol:get#2,a$:i=st:if
a$=chr$(10)thena$=chr$(13)
```

then the program will *replace* linefeeds with carriage returns.

Wrap Up

It has been a long time since I uploaded a text file with embarrassing formatting, as I've learned that it's an easier process if I always stick with using ASCII format for my text files. This way, without having to look at the contents of the file, I know I can pass it on to others (even those who use other computer platforms) and the file will come out ok. I see ASCII as an equalizer because as long as the file is in ASCII, anyone on any computer can read it.

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Just For Starters

by Jason Compton

PUTTING DISK DRIVE ENHANCERS TO WORK

Ask any Commodore user, past or present, about their floppy drive and you can be sure you'll hear a derisive comment. The 1541, in particular, is a very slow creature. Stories and legends abound as to why it is the way it is, but what's important to know is that there are a variety of things you can do about it. You can add a variety of equipment to your machine to make your floppy access faster and friendlier.

The most basic disk drive enhancement is called the DOS Wedge. A software-only version of this tool is provided on most 1541 and 1571 demo disks which shipped with the original drives. Its task is to give you easy access to the DOS (Disk Operating System) on your floppy. Under normal circumstances, sending a command to your disk drive to do things such as formatting a disk or deleting a file requires that you enter a small program in BASIC. The most typical syntax is:

```
OPEN 15,8,15,"[Command]":
CLOSE 15
```

In the space between the quotes, you can enter any of the number of commands that can be sent to the drive. What is happening is that you're opening communication with your disk drive (which by default is drive 8, but this can be changed if you are using multiple drives), sending it the command between the quotes, and then closing the communication. This is not the most convenient way to do things. A DOS Wedge takes this unnecessary overhead away and makes DOS commands much easier.

The DOS Wedge is typically accessed using the "@" symbol. Typed by itself, the "@" symbol will tell you the status of your disk drive. When the drive is inactive and the drive access light is not flashing, you should be told that all is "OK". If the drive access light does flash, which is the standard way to indicate an error, the "@" command typed by itself returns the error status, with a two-digit code and a short text explanation.

Without a DOS wedge, retrieving this error code requires a short BASIC program which you would have to type in any time you wanted to see the error message—you can't load such a program from disk, because doing that load would cancel the error message. You can then look up the error message in your drive's reference manual if you need further explanation of what the error signifies.

The wedge does more than just return the error status, however. Anything typed after the "@" is sent to the disk drive as a command, just as anything between the quotation marks is in our earlier example. So to delete a file called "testfile" using a wedge, you simply type

```
@S:TESTFILE
```

and the drive will execute your instructions. As you can see, this saves a great deal of typing, and is more convenient if you need to carry out multiple deletions in a sitting.

Another bonus of the DOS wedge is the ability to see a disk drive directory without erasing a program you might currently have in BASIC. Typically, one gets a directory by typing:

```
LOAD"$",8
```

and then LISTing. But this will wipe out anything you have in BASIC, making it irretrievable. This is extremely inconvenient, particularly if you are in the middle of typing in a program and need to see how much space is available on your current disk or what filenames are already taken up. A DOS wedge can directly read the disk's directory to the screen, preserving everything else you may have in memory. Most DOS wedges accept the command

```
@$
```

to display a "non-destructive" disk directory. (Some older cartridges leave off the "@" and simply require a single "$" to be typed to give you a directory.)

A DOS wedge cannot itself make disk drive access for loading and saving files any faster, it can only make your disk operations quicker to type in. However, there are various hardware devices that give you both a DOS wedge and some form of disk drive turbo. Typically, these fall into two categories: cartridges and ROM replacements. The SuperCPU's built-in JiffyDOS falls into both categories, and we'll deal with that later in the issue.

A Collection of Turbo Cartridges

There are over a half-dozen of these for the Commodore computers. Most are Commodore 64 compatible only, and will force a 128 to boot in 64 mode. The first cartridges started appearing in the early 80s and some, like the Action Replay, were developed and produced until very recently. This does mean that none are available on the new hardware market, but there are scores of them out there, and many systems being sold include these devices.

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All of the turbo cartridges offer some sort of DOS wedge, and will accelerate disk and sometimes even tape drive loading and saving. By and large, their turbo methods are compatible only with Commodore 1541 and 1571 drives, and will fail to work with clone floppies or drives like the 1581, FD-2000, and hard drives. Further, the turbo methods are very compatible for loading single files but often are unfriendly in commercial software, particularly those which are copy protected. Your mileage will vary, and you'll likely become familiar with your particular cartridge's disable method. All of them have some way or another to render them almost invisible, but occasionally you just have to remove them altogether to get certain stubborn programs to run, which is a shame.

Among most of these DOS enhancers, you can expect to find shorthand commands for such things as loading and saving programs. Typically, the "/" is used to designate program loading and "%" is used to designate loading a machine language program (replacing loading ",8,1" in regular BASIC.)

An overview of the features and low points of the cartridges you can expect to find out there is in order.

Action Replay 5 and 6: This was the last "supercartridge" in active production, and not coincidentally it's the best overall. A DOS wedge was standard, and had the nice feature that it verified all erase-type operations (format and scratch) with an "Are You Sure?" question, in case you were making a mistake. The disk drive access is significantly increased. Action Replay offers the most complete "freezer" available. Recent readers of this column will have heard me extol the virtues of the freezer, but suffice it to say here that freezers allow you to save off a game at any point, explore the code of a program as it runs, and much more.

Action Replay is among the many cartridges which offers a machine language monitor. There are also built-in disk utilities, such as file and disk copiers. The AR will boot a 128 directly into 64 mode. It is somewhat compatible with JiffyDOS (see later in the article for more on JiffyDOS) but sometimes the two conflict. One of the most notable features of the Action Replay was its ability to save programs in a custom "Warp25" format, which boasted the ability to be loaded on any 64 (using an Action Replay or a custom loader program you could include on the disk) at up to 25 times the normal speed. These programs tended to be larger than standard files, however, so are not recommended for all purposes. Finally, the Action Replay has a reset button, which can come in very handy if your machine doesn't have one already. Using a reset button is faster and less wear on your machine than having to physically turn it off and on again.

Final Cartridge 3: The Final Cartridge is a powerful one, but is quirky in its own ways. It sports the most novel feature of any of the cartridges or ROM enhancements, namely a GUI environment where you have access to a notepad program, disk utilities, and a few other tools. It's no GEOS, but it's entirely built-in to the cartridge. But most people will be using the FC in BASIC, where it displays the aforementioned quirks. Like the others, it has a DOS wedge, but instead of the typical "@" command, the Final Cartridge's wedge command is DOS". For example, our earlier delete example would be

```
DOS"S:testfile
```

when using a Final Cartridge. Other conventions are also rejected. Instead of the familiar "/" for program loading, the command is DLOAD, and similarly DSAVE for turbo disk saving. The Final Cartridge isn't a total waste, however. It has a freezer, although not one as powerful as the Action Replay's. Its printer support for screen dumps, however, is quite powerful, and its machine language monitor allows easy searching for sprites and custom fonts, if you're interested in those sorts of things. Like the Action Replay, the Final Cartridge shows you the addresses in memory a program is being loaded into, which is very useful for programmers, and it too boasts a reset button. All in all, a powerful cartridge and well worth a look if you can find one.

You can add a variety of equipment to your machine to make your floppy access faster and friendlier.

Mach 5 and Mach 128: Access did more than just publish such memorable titles as Leader Board Golf and 10th Frame Bowling, they manufactured and sold these turbo cartridges. The Mach 5 is designed for the C-64 only, while the Mach 128 will operate in both 64 and 128 modes, set by a built-in switch on the top of the cartridge. It predates the "supercartridges" like the AR and FC, but still offers a DOS wedge, disk accelerator, and various useful utilities.

Unlike most of its counterparts, it does not have a built-in menued set of utilities like the Action Replay or a GUI-driven utility screen like the Final Cartridge. Instead, you access the special commands using the back arrow, and a menu can be brought up on your BASIC screen at any time if you've lost your manual. One notable feature of the Mach 128 is that with a two-key command, you can use the 128's extra keys (like the upper row of cursor keys and the numeric keypad) in 64 mode. The Mach cartridges do things a little differently than other cartridges do: disk messages returned from a DOS wedge command are displayed in reverse, and typically over the line you've just typed (rather than a line or two lower as is normal for other wedges).

The Mach cartridges are on the slower side, but the 128 model in particular stands out as being compatible with both sides of a 128 system. There is a reset button mounted on the 128 version but not the original Mach 5.

Fastload: To my knowledge, Epyx's Fastload was the first to hit the market. At one point or another, everybody has to answer to a comparison to Fastload. At times it seems pretty low-frills: there's a straightforward, standard DOS wedge and a better-than-nothing disk accelerator. But there's actually a bit of power stashed in the little black cartridge, since there's a built-in menu of utilities to do disk copying, file copying and erasing, and even disk sector editing. A rudimentary machine language monitor is also included. There's no reset button, but for 128 users at least this isn't a major problem.

JiffyDOS and Other ROM Replacements

The nice thing about the cartridges is that they're easy to install and are more or less instantly gratifying. But they tend to disappoint for some things, like providing compatibility and faster load and save times within commercial software and games. ROM replacements like JiffyDOS on the other hand are harder to install since they require you make a few changes within your actual comptuer and disk drive, but can often pay dividends in their enhanced capabilities, such as support for non-5 1/4" floppy drives.

Currently, JiffyDOS is available to fill this niche. While it cannot generally boast the conditional 25X speed increases some cartridges can get on specially saved files, it does have the authority to promise fast loading and saving within most any software package, and it does indeed work with more software.

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Table 1
Comparison of Load Speeds
149-block PRG file

Product	Load Time	Times Faster
Stock 64	97.1 sec	
Mach	21.2 sec	4.6
Fastload	20.5 sec	4.7
JiffyDOS	18.7 sec	5.2
Final Cartridge	12.5 sec	7.8
Action Replay	8.7 sec	11.2

JiffyDOS' built-in DOS wedge is second to none in its command set. The standard DOS commands you and I would need to use on a daily basis are all there, as well as a set of enhanced commands to handle things like the enabling and disabling of JiffyDOS' various features and specially mapped commands which let you copy files between disk drives quickly and entirely within BASIC, without relying on support programs. Virtually all of the JiffyDOS extended commands are available from BASIC programs, which is not necessarily true of all DOS wedges. And you can apply the JiffyDOS wedge to any JiffyDOS-aware device, such as CMD hard drives, the FD-2000, and the RamLink.

The advantages of JiffyDOS are the increased compatibility, the ability to disable the turbo on the fly, and the extended command set and power with modern hardware. The disadvantages are that it does not provide any sort of reset capability nor a machine language monitor or freezer. These are still the domain of the cartridges. Because JiffyDOS leaves your cartridge port free, you can often use a cartridge simultaneously with JiffyDOS, although occasionally you'll discover that the two systems will compete. This typically shows up with certain wedge commands which one of the systems does not support, or with special, newer devices like the FD-2000. You may need to temporarily disable your cartridge for certain operations.

JiffyDOS is built into the SuperCPU cartridge port unit, but this only gives you JiffyDOS when the unit is enabled. When disabled (as is sometimes necessary to run certain software which fails even when the SuperCPU is enabled but turbo is off), the machine itself needs JiffyDOS installed in it as well if you wish to have it in all circumstances. If not, then you only need JiffyDOS as provided in the SuperCPU and can use a cartridge in other situations.

So, if you're tired of the frustration of understanding Commodore disk operations, or are fed up with slow loading times, you'd do well to investigate these options more fully. You may find products out there—older versions, or different models—that we haven't covered here, but the basic principles are more or less universal. Look for the solution that suits your needs.

Table 2
Compatibility with SuperCPU and JiffyDOS

Product	JiffyDOS	SuperCPU
Fastload	No[1]	No[2]
Action Replay	Yes	No[3]
Final Cartridge	Yes	Somewhat[4]
Mach	Somewhat	No[5]

Notes:
[1] Using either Fastload or JiffyDOS commands fails, but regular commands seem to work.
[2] The system boots, but completely ignores Fastload.
[3] The system crashes immediately, a result of the incompatible memory maps used by the AR and SuperCPU.
[4] At times, the system may ignore the fact that the Final Cartridge is active.
[5] The system boots, but disk loads fail.

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GEO PROGRAMMIST

MIXING DESK ACCESSORIES & DIALOGUE BOXES

By Maurice Randall

Have you ever tried to find documentation on how to write a Desk Accessory? Look all you want, the info is very slim indeed. Neither the GEOS Programmer's Reference Guide nor the Hitchhiker's Guide to GEOS cover it. The most they talk about it is in the explanation of a couple of kernal routines that are used for loading desk accessories. Perhaps the manual that is supplied with GeoProgrammer covers it best since it provides some example source code. But there are many little details that you as a programmer will discover as you attempt to write your first Desk Accessory (DA).

One of the biggest problems you'll face is how to use a dialogue box (DB) from within a DA. This about drove me crazy the first time I tried to do it. I got frustrated and just created my own icons instead. But there was one feature that I just simply could not access without a DB. The DBGETFILES function. This function is only available from within a DB.

Actually, I could get a DB to work from a DA. The DA would seem to load and run just fine and even the DB would pop up as expected. But just as soon as I would exit the DA to return to the application, the system would crash. Let's figure out why.

Little Applications

The main idea behind a DA is to expand the functionality of any application that wishes to support a DA. A DA is nothing more than an application in reality. It is the way that GEOS handles them that really makes them different from an application. When an application is running, aside from the operating system, it is the main controller of the computer. When a DA gets loaded, the application remains in the computer except for the area of memory where the DA resides. That area of memory is preserved and then restored upon exiting the DA. The method which the area is preserved varies depending on the system. In GEOS 64, up through V2.0, the area of memory is saved to a disk file on the current drive. In GEOS 128, up through V2.0, it is instead moved into bank 0, the back ram area.

This saving of a DA to disk on the 64 means that the disk needs enough free space to accomodate the amount of memory that will be preserved. Also, the disk cannot be write protected. It would be equal to the size of the DA itself. On the 128, if the application is using the back ram for itself, it must deal with that issue also.

Since a DA can be loaded while an application is running, GEOS must also preserve some other aspects of the computer's memory. Critical variables and other locations are saved prior to loading the DA and then restored upon exit. There are a total of 378 bytes in all which must be preserved. These are all saved to an area known as dlgBoxRamBuf which resides at $851f. GEOS uses two routines to handle the saving and restoring of these 378 bytes, SaveState and RstrState. They are internal routines used by GEOS only and cannot be called directly by an application.

A DB is in some ways similar to a DA. The state of the machine is also saved and restored before and after a DB is used. The main difference is that a DB is intended to be contained within an application and so the area of memory where it is located is not saved since it is up to the application on how to load the routines for the DB. Small applications will likely have the DB routines already contained within the code. Larger ones might store the routines in separate VLIR records.

The main similarity in how GEOS deals with DA's and DB's is in the fact that SaveState and RstrState are also used with DB's. This means that the same area at dlgBoxRamBuf is used to store the state of the machine. And there's where the conflict lies.

If you run a DB from within a DA, the state of the machine will be saved as it is while the DA is loaded. The state that it was in before the DA was loaded is lost since dlgBoxRamBuf got overwritten when the DB started up.

I would guess that when GEOS was first created, DB's were instituted before desk accessories were thought of. The name given to the area at dlgBoxRamBuf seems to imply this. When DA's were included in the kernal, the designers decided to use the same location and access the same routines for preserving the state of the machine. Of course, things like this were necessary due to the lack of available memory.

There Is Always A Way

By now, you should be realizing a simple solution to the problem. From within our own DA code, if we set aside an area of memory that is 378 bytes in size, we can save the area at dlgBoxRamBuf before calling DoDlgBox and then restore it afterwards, or at least sometime before exiting the DA. Here's a segment of code that would do this:

```
...
   jsr iMoveData
   .word dlgBoxRamBuf
   .word dbRamBuf
   .word 378
 ...
;routines here for the DB...
 ...
   jsr iMoveData
   .word dbRamBuf
   .word dlgBoxRamBuf
   .word 378
...
dbRamBuf:
   .block 378
```


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We're Not Done Yet

In our case here, we are using a DB from a DA, and a DA should refrain from disturbing the background screen. This also means that the DA needs a way to recover it's own appearance after running the DB. And you certainly don't want the area of the screen where the DB is to be saved to the background screen. That could really mess up the application the DA is running from. You can't be sure if the background screen is being used as such or if it is holding program code.

The easiest way to handle this is to keep the DB in the area where the DA has set up it's ownself. The DA might have drawn a rectangle to operate in or some other form of screen appearance. In any case, if the DB is only messing up the actual DA, then it is a simple matter to redraw the DA after exiting the DB. If you put the DB outside of the DA, then you will likely have a lousy looking screen when the DB exits since it was drawn over whatever the application had running.

If your DA is only using a DB and nothing else, then you need not worry about saving and restoring the screen. It will be handled as soon as the DB is finished because your DA will also end. But you still need to keep GEOS from messing up the background screen as well as the foreground screen upon exit. Here's how we do it:

```
   LoadW RecoverVector,#DoNothing
...
;open the DB here.
...
;redraw the DA here.

DoNothing:
   rts
```

When GEOS exits a DB, it calls whatever RecoverVector is pointing at in order to restore the screen appearance. Normally this vector points to RecoverRectangle since the coordinates for the DB are preloaded for RecoverRectangle to use. This will cause the area of the background screen to be drawn to the foreground screen where the DB was located. We do not want this to happen since the background screen does not contain what used to be on the foreground screen, at least not in our case here. So, we loaded RecoverVector with a routine that does absolutely nothing. It could also point to the routine that would redraw the DA. In many cases, that would be better. Don't worry about restoring RecoverVector, GEOS will take care of it when your DA exits. Remember SaveState and RstrState?

A DB From Within a DB

I suppose I should cover one more thing. By now, you should understand that you can't run a DB from within another DB. The state of the machine also applies here. You can do it if you really want to. The general method, however, is to exit a DB and then run the next one. Clicking on an icon within a DB should merely set the variable sysDBData with a value that corresponds to whatever you wish to do and then call RstrFrmDialog. Upon exiting the DB, that value will be loaded into r0L and can be easily checked.

But if you really want to run another DB without actually leaving the current one, you will first need to preserve the area at dlgBoxRamBuf like we already discussed and also preserve one other important location. Just like an application has the use of registers at a0-a9, GEOS has it's own register known as s0. In GEOS 64, this two-byte register is located at $0043, while on the 128, it is at $0044. You must preserve this if you wish to call another DB without exiting the current one. This register is used as a pointer as GEOS is building the DB and using it. It is set differently each time a new DB is created. The safest thing to do with this is to save all 3 bytes from $0043 to $0045 so that your code will work with either system.

As you can see, you can be quite creative and accomplish many complex and useful things with just a little bit of work on your part. The biggest problem is simply knowing how to do it.

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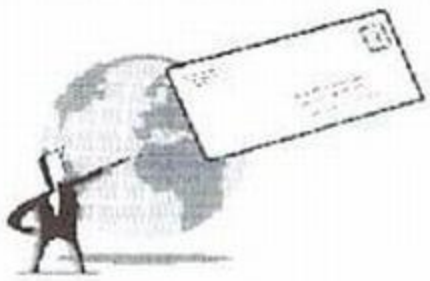

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BASIC INSTINCTS

PROGRAMMING PEARLS: THE PREQUAL!

By Doug Cotton

BASIC, despite its occasional pitfalls, allows average users to create useful programs quickly. I often find myself in a situation where I have a file that needs some special formatting, character translations, or other modifications that can't be done quickly with a word processor or by any other means I have handy. When these situations crop up, I turn to my trusty Commodore and the built-in BASIC.

While I may find it easy to jump into these "little" projects, I'm certain that a lot of other users do not, simply because they haven't learned the tricks that make coding effective for tackling everyday situations. In last issue's installment of BASIC Instincts, David Pankhurst covered some nice programming techniques for avoiding problems in your code. However, there are a number of simpler issues better aimed at beginning BASIC programmers that were not addressed, and I'd like to take this opportunity to point some of these out. And since I'm targeting beginners, let's start at the very beginning...

Be the Program

Before you write even one line of code, be clear about your objective. Know what you expect your program to do, and think about what information your program will need to accomplish the task. It isn't necessary to create flowcharts for small programs, but if it helps, do it. It's important that you mentally break the program down into manageable segments before you start coding, because if you do this effectively, you'll code effectively

Program for Readability

Once you begin programming, possibly most important tip I can give you is to write code that's readable. Often you'll find yourself spending twice as much time (or more!) making your code work than you did writing it in the first place. Making your code easy to read is one of the quickest ways to improve the writing:debugging ratio that haunts every programmer. In addition, when you find you need a similar program six months after you wrote a particular piece of code, you'll find it easier to go back and make modifications if your code is readable.

There are numerous ways to make code more readable. The first step is to start right off with a comment:

```
10 REM TRANSLATE TRUE ASCII FILENAME TO
PETSCII
```

Advanced variation: Color your REM statements. Here's how: Type the line number and REM command, then type two quotes. Delete the second quote, then enter {RVS ON} {SHIFT-M} {RVS OFF} {INST}. Follow this by selecting a color using {CTRL-1} through {CTRL-8} or {CMDR-1} through {CMDR-8}. Type your remark text, and end it with another {INST} and color selection. Press {RETURN} when done. If you did this right, your line will change colors when listed. The first color code is for the remark itself, while the one at the end is for lines that follow it. The reversed {SHIFT-M} issues a PRINT command when the line is listed.

Follow remarks with something that will make them stand out from the rest of the program lines: a 'dummy' line:

```
20 :
```

Yes, nothing more than a line number with a colon. Simple, yet effective. You should use dummy lines both before and after remark lines in your program, as well as to separate sections (this will be automatic if you put remarks at the beginning of each segment).

Another good use of colons is to indent loops. Here's an example:

```
90 :
100 REM LOOP TO POKE STRING INTO BUFFER
110 :
120 FORI=1TOLEN(AS)
130 : POKE511+I,ASC(MIDS(AS,I,1))
140 NEXT
150 :
```

Using colons this way makes it easy to see just what lines are executed in a given loop, which can help a lot during debugging. Notice something else about this code: there's only one programming 'sentence' per line. If the same line were written by someone who didn't care about readability, it might look something like this:

```
100 FORI=1TOLEN(A$):POKE511+I,ASC(MID$(AS,I,1
)):NEXT
```

Alone, this line doesn't seem too bad; but start stringing a lot of lines like this together, and you've created a chore for yourself when it comes to tracking down where something specific is going on.

Test Complex Routines in Advance

While it isn't often I find myself in unfamiliar territory with BASIC, I do still run into the need for a routine that I haven't coded in quite some time. When it comes to these situations, I save myself a lot of debugging by "prototyping" the routine first. That is to say, I create the routine in high line numbers as if it were a stand-alone program, and then RUN it, closely monitoring the results. Let's look at an example of this in action. Imagine that I want to write a routine that creates eight decks of cards, which will later be shuffled, and I want to store these in memory. Each deck has 52

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cards, and can be further broken down into four groups of 13 cards, a group for each of the four suits.

To save memory, I've decided to store both the card value and suit in a single byte. This requires 52*8 bytes, or 416 memory locations. The card value can be up to 13, so in binary this will require 4 bits. I'll store this in the low nibble (a nibble is half a byte), and I'll store the suit in the high nibble. To prototype my requirements, I first need to check on creating each byte value correctly. To do this, I'll use exponentiation and a logical OR to move the card suit into the high nibble. To prototype this I type:

```
20000 : FORS=0TO3
20010 : : FORV=0TO12
20020 : : : PRINT((S+1)*(2^4))OR(V+1),;
20030 : : NEXT
20040 : : PRINT
20050 : NEXT
```

When I type RUN20000 and press the {RETURN} key, I get a display of the numbers that my formula generates. I got lucky, and coded this correctly. I realize that my initial code only gives me one deck, but placing this code within another loop of 8 to create 8 decks will be real easy, and at the moment I'm more interested in simply testing the values I create for each card. Now that I know my theory for creating the numbers works in practice, I can add the two lines I need to generate 8 decks:

```
19990 FORD=0TO7
20060 NEXT
```

Notice that I have used 0 instead of 1 to begin each loop, and ended each loop at a value one lower than the number of iterations that were needed. The reason I did this is because I knew from the beginning that I would also be using these loops to generate memory locations for storing the cards. Generating those locations will be easier when the loops begin with a zero. Since I chose this method, the program needs to add one to each variable as it calculates the suit and card numbers. To check out how I can store these values to memory in sequence, I add the following line:

```
20018 : : : PRINT49152+(D*52)+(S*13)+V,;
```

I also remove the comma and semicolon from the end of line 20020. When the program is RUN, it prints each memory location and what would be placed into it. I watch the numbers carefully, using the {CTRL} key to slow down the process. The numbers are right, so I can now remove lines 20018 and 20040, then edit line 20020 to read:

```
20020 : : : POKE49152+(D*52)+(S*13)+(V),((S+1
)*(2^4))OR(V+1)
```

The routine is pretty much complete, and I can renumber the lines (by editing the current numbers and pressing {RETURN}) and delete these lines (by entering the just the line numbers themselves) to move the routine to where I want it in my main program. Naturally I'll add a comment and some dummy lines to set it apart. Instead of moving the routine, I could also just as easily have left it where it was, added a line with a RETURN statement at the end, and used it as a subroutine.

The important thing to glean from prototyping individual routines, whether it be in BASIC or any other language, is that you know that the routine you've just written is operating correctly before you make it a part of your entire program. In most cases, then, you will have eliminated most coding errors before they become difficult to track down.

Using Parentheses

Before we move on, there's another tip associated with this routine that I'd like to point out to you. Looking at the math routines, you'll notice I used a lot of parentheses to separate things. This is good—or at least better than not having them when you might need them, but aren't sure. To prove this point, take the ((S+1)*(2^4)) calculation into consideration. If this instead read (S+1*(2^4)), the result of this calculation would be wrong! The reason for this lies in the way BASIC prioritizes mathematical operations; unless otherwise forced by parenthesis, multiplication takes precedence over addition. So instead of getting S+1 times 2^4, you'd get S plus 1*(2^4), which isn't the same.

You'll also note in the card routine that I used parentheses to enclose math operations on either side of a logical operator (OR in this case). Doing this by habit takes care of some parsing problems that could show up with AND and OR. Take a look at this line for example:

```
X=TANDA
```

While the statement is trying to AND the variable T with the variable A to get the result X, BASIC reads from left to right and sees TAN after the equal sign, and assumes that the program is trying to get the TANGENT of some parameter. Since TAN requires its argument in parentheses, this line will cause a SYNTAX ERROR. You can have a similar problem with the logical operator OR. Here's an example:

```
X=FORA
```

Here BASIC assumes the start of a FOR/NEXT loop, and again you'll get a SYNTAX ERROR. You can fix these problems in one of two ways; either use a space to separate leading variables from logical operators, or parenthesize. I generally use the latter for two reasons; someone reading the code might leave a space out to save room, and parentheses help to clarify the logic of a particular statement.

Bypassing BASIC Quirks

There are other quirks in BASIC that can cause you unforeseen problems, and some of them can be a bear to track down if you're not on top of debugging techniques.

Take converting strings to PETASCII values as an example. This is normally done with the ASC keyword, and the proper way to do it is to add a null string (CHR$(0)) to the string you're converting. Here's how:

```
A=ASC(A$+CHR$(0))
```

You've probably seen this done in many programs, but some of you may have wondered why it is done. The reason behind it is that BASIC won't properly convert an empty string to a null value (0)—it needs help. So as long as you use the method above, you won't need to worry about getting an ILLEGAL QUANTITY ERROR, at least not with that particular conversion.

While I can see that I'm running out of room here, there's no shortage of BASIC quirks to go around. Before we revisit this subject, however, we'd like to hear from you, out readers. Tell us about you favorite work-around for a BASIC inconsistency, and we'll pass it along to everyone else.

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ASSEMBLY LINE

DRIVING THE GEOCABLE

By Doug Cotton

This issue we're going to mix our machine language with a little hardware. As indicated by the subject heading, that hardware is the geoCable. What's a geoCable? It's a rather simple cable that connects between the Commodore User Port and a standard printer's Centronics port. This kind of connection is much less expensive than using a smart interface, and printing is actually much faster as well.

What's the catch? As you may have guessed, there is one. The catch is that most programs don't know how to use such a cable—it requires custom printer drivers. While this makes the cable easily applicable to programs like *GEOS* that can use external printer driver files, it would be nearly impossible to use with programs like *The Print Shop*, which has all of its printing information embedded in the main program.

Luckily, some of the most important printing programs—word processors—often have support for this type of cable. But for those of us who like to create our own programs, writing and integrating a geoCable driver is a prerequisite for using this cable.

To get started, we should take a brief look at the signals and timing information related to driving a Centronics port printer. Figure 1 has this information. Data is written to the printer by pulling the STROBE (STB) line low for minimum of 1 microsecond (T2) while the data is valid. Data should be valid for .5 microseconds both before (T1) and after (T1) the low state of the STROBE line. When STROBE goes low, the printer forces the BUSY signal high, and maintains it in this state until ready for more data. When BUSY retruns to a low state, it also forces the ACKNOWLEDGE (ACK) line low for a maximum of 5 microseconds (T4). There is no specification on how long BUSY can stay high; this will vary on different printers, and will also change on many printers as the internal buffer RAM becomes full.

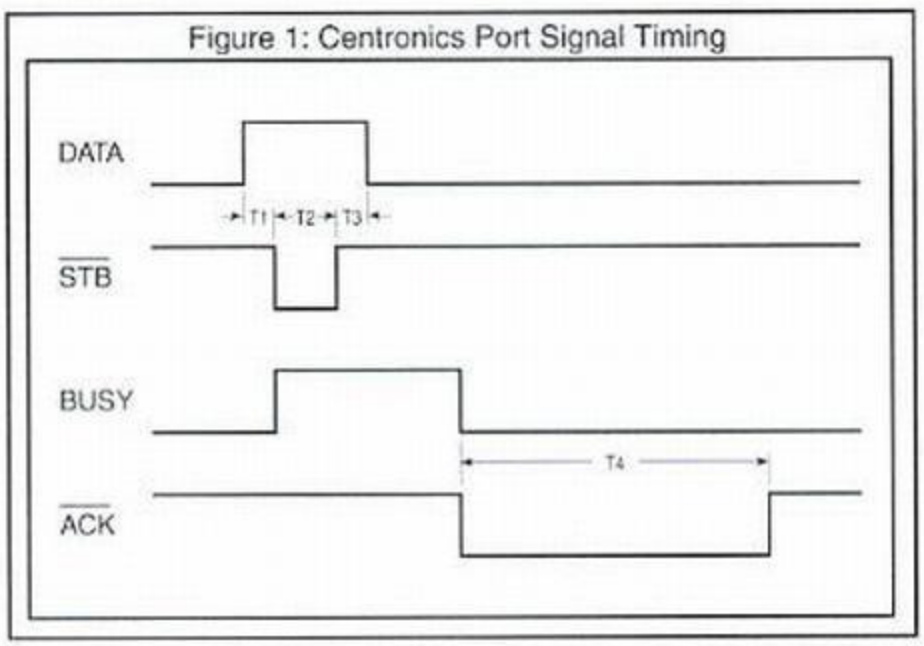
Implementing a Driver

To implement a driver, we need only apply the specification while considering the signals available to us via the geoCable (as shown in the geoCable Wiring Connections in Table 1). Due to the limited I/O lines available on the User Port, a minimal hardware specification has been used. This connects only the data lines, BUSY signal, and STROBE line to the computer, as well as the various signal grounds.

The data lines connect to Port B of CIA 2. The port itself is accessed at location $DD01, while the direction of the port signals are set in location $DD03. The STROBE line is connected to the only other I/O port line available on the User Port, Port A bit 2. This line can be accessed as bit 2 of location $DD00, while bit 2 of $DD02 controls the direction of data on this line. Since all of the actual I/O lines have already been used by the data and STROBE lines, the BUSY signal has been connected to the FLAG2 line. This latter connection will tell us when BUSY goes low by setting bit 4 of $DD0D, CIA 2's Interrupt Control Register.

The following code is a general implementation of a driver based on the information provided above.

Figure 1: Centronics Port Signal Timing




```
PORTA   =   $DD00
PORTB   =   $DD01
DDRA    =   $DD02
DDRB    =   $DD03
ICR     =   $DD0D
;
        JMP  START1        ; CHAR IN $FB
        JMP  START2        ; CHAR IN .A
;
TMPDDRA .BYT $00
TMPDDRB .BYT $00
;
START1  LDA  $FB           ; GET DATA FROM $FB
START2  PHA                ; PUSH ON STACK
CINIT   LDA  DDRA          ; LOAD CURRENT DDRA
        STA  TMPDDRA       ; AND SAVE
        LDA  DDRB          ; LOAD CURRENT DDRB
        STA  TMPDDRB       ; AND SAVE
        LDA  #$FF
        STA  DDRB          ; SET PORT B FOR OUTPUT
        LDA  DDRA          ; LOAD CURRECT DDRA
        ORA  #4            ; SET BIT 2 FOR OUTPUT
        STA  DDRA          ; AND STORE
;
OUTPUT  PLA                ; POP BYTE TO OUTPUT
        PHA                ; POP BACK ON STACK
        CMP  #13           ; IS IT A RETURN?
        BNE  XLATE         ; NO, TRANSLATE
        JSR  OUT           ; YES, OUTPUT IT
        PLA                ; POP STACK
        LDA  #10           ; SET FOR LINEFEED
        JSR  OUT           ; AND OUTPUT
;
EXIT    LDA  TMPDDRA       ; GET OLD DDRA
        STA  DDRA          ; AND RESTORE
        LDA  TMPDDRB       ; GET OLD DDRB
        STA  DDRB          ; AND RESTORE
        RTS                ; EXIT ROUTINE
;
```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```
XLATE   PLA             ; POP BYTE TO OUTPUT
        CMP  #$DE       ; IF BYTE >= $DE
        BCS  XDONE      ; DON'T TRANSLATE
        CMP  #$C1       ; IF BYTE = $C1 TO $DD
        BCS  XDOWN      ; TRANSLATE
        CMP  #$5D       ; IF BYTE = $5D TO $C0
        BCS  XDONE      ; DON'T TRANSLATE
        CMP  #$5C       ; IF BYTE = $5C
        BCS  XUP        ; TRANSLATE
        CMP  #$5B       ; IF BYTE = $5B
        BCS  XDONE      ; DON'T TRANSLATE
        CMP  #$41       ; IF BYTE = $41 TO $5A
        BCS  XUP        ; TRANSLATE
        BCC  XDONE      ; DON'T TRANSLATE $40 OR LESS
;
XDOWN   SEC             ; SET CARRY BIT
        SBC  #$A0       ; SUBTRACT $A0 FROM BYTE
XUP     CLC             ; CLEAR CARRY BIT
        ADC  #$20       ; ADD $20 TO BYTE
;
XDONE   JSR  OUT        ; OUTPUT BYTE
        JMP  EXIT       ; AND FINISH UP
;
OUT     STA  PORTB      ; PUT BYTE ON DATA LINES
        LDA  PORTA      ; GET CURRENT PORTA DATA
        AND  #$FB       ; CLEAR BIT 2
        STA  PORTA      ; AND STORE TO SET STB LOW
        ORA  #4         ; SET BIT 2
        STA  PORTA      ; AND STORE TO SET STB HIGH
        LDA  #$10       ; MASK FOR FLAG STATUS
-       BIT  ICR        ; TEST BUSY
        BEQ  -          ; BRANCH IF NOT SET
        RTS             ; EXIT IF SET
```

Figure 2: Centronics Connector

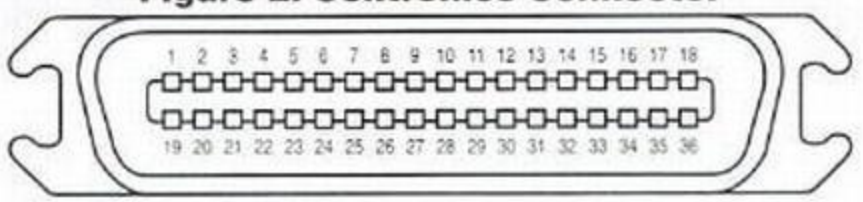

Table 1: geoCable Wiring Connections

Centronics Port		User Port		Centronics Port		User Port	
Pin	Function	Pin	Desc.	Pin	Function	Pin	Desc.
1	(STB)	M	(PA2)	19	(GND)	A	(GND)
2	(DATA 0)	C	(PB0)	20	(GND)	A	(GND)
3	(DATA 1)	D	(PB1)	21	(GND)	A	(GND)
4	(DATA 2)	E	(PB2)	22	(GND)	A	(GND)
5	(DATA 3)	F	(PB3)	23	(GND)	A	(GND)
6	(DATA 4)	H	(PB4)	24	(GND)	A	(GND)
7	(DATA 5)	J	(PB5)	25	(GND)	A	(GND)
8	(DATA 6)	K	(PB6)	26	(GND)	A	(GND)
9	(DATA 7)	L	(PB7)	27	(GND)	A	(GND)
10	(ACK)	n/c		28	(GND)	n/c	
11	(BUSY)	B	(FLAG2)	29	(GND)	A	(GND)
12	(PO)	n/c		30	(GND)	n/c	
13	(SELECT)	n/c		31	(PRIME)	n/c	
14	(AFAT)	n/c		32	(ERROR)	n/c	
15	n/a	n/c		33	(GND)	A	(GND)
16	(GND)	A	(GND)	34	n/a	n/c	
17	(GND*)	n/c		35	n/a	n/c	
18	(+5)	n/c		36	n/a	n/c	

*Frame Ground generally isn't used and should not be connected to other grounds.

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CMD SUPERCPU RAM EXPANSION & TIMING

By Doug Cotton

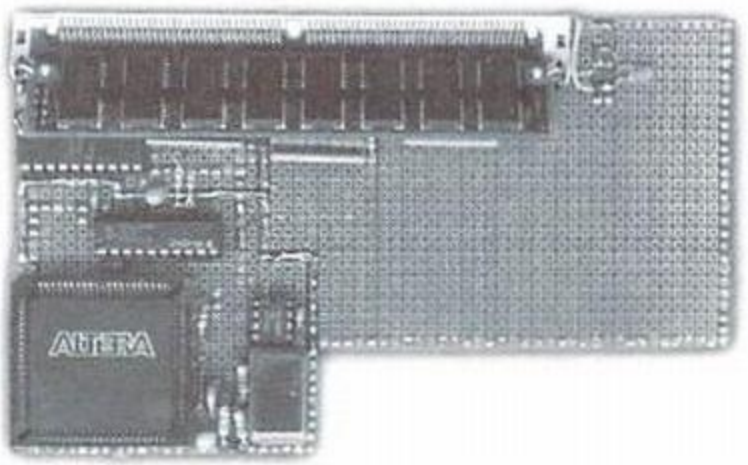
One of the more anticipated releases for the SuperCPU is just around the corner. I'm speaking of the SuperRAM card for the SuperCPU 64, long awaited by many of the developers involved in creating new programs for SuperCPU-enhanced systems. The card will allow larger programs or programs with extensive data to be fully loaded into memory (as opposed to bringing in separate modules from disk, a process that is both slow and inconvenient). New programs, written with the SuperCPU and SuperRAM card in mind, can offer more powerful features. But before we get into technical details, let's take a more general look at the SuperRAM card itself.

Pictured on the right side of this page is the prototype SuperRAM card which CMD has developed for testing. The board contains only a few components: a clock oscillator, bus driver, a reprogrammable array logic device (GAL), a digital delay chip, a complex programmable logic device (CPLD), and a handful of resistors and capacitors. There are also two connectors on the back of the circuit board (not shown) which attach the SuperRAM card to the SuperCPU main board, and a 72-pin SIMM (Single Inline Memory Module) socket where the RAM SIMM is installed.

As with the SuperCPU itself, the SuperRAM card's complex circuitry is mostly inside the CPLD, which contains most of the memory mapping, control and refresh circuitry. While this vastly decreases the amount of board space required, developing the logic equations needed to program the chip for a specific function often proves to be very time-consuming.

SuperCPU 64 RAM Expansion Card Prototype

Slated for release in the next few weeks is the RAM Expansion Card for the CMD SuperCPU 64. This card can contain from 1 to 16 Megabytes of RAM (using standard 72-pin SIMMs) that can be used by future applications. A GEOS driver is expected to ship with the card.



SIMM Chart

The chart below indicates the size and organization of 72-pin SIMMs supported by the SuperRAM card for the SuperCPU. All SIMMs must be Fast Page Mode type, 70ns or faster.

SIMM Capacity	Row Size	Row/Column Adr.
1 MB (256K x 32/36)	2 KB	9/9
4 MB (1M x 32/36)	4 KB	10/10
8 MB (2M x 32/36)	4 KB	11/10
16 MB (4M x 32/36)	4 KB	12/10
16 MB (4M x 32/36)	8 KB	11/11

The SIMM socket can be fitted with 72-pin memory modules containing from one to 16 Megabytes of standard Fast Page DRAM. It's very important to make sure that the SIMM used is standard Fast Page; EDO and other 72-pin SIMM types are not compatible, and will not operate correctly. The memory must be rated at 70 ns or faster (the lower the number, the faster the speed rating), but bear in mind that faster RAM doesn't translate into faster access (the DRAM controller has fixed speeds for performing memory access).

For additional information on compatible SIMMs, see the SIMM Chart included with this article. The chart fully specifies all SIMMs approved for use with the SuperRAM card.

The General Memory Map

Since the 65816 processor can address up to 16 Megabytes of RAM, the SuperRAM memory is unlike previous RAM expanders (such as the Commodore 17xx series REU's) in that programs can actually execute directly from this memory. It's also important to note that programs don't have to use the 65816's native mode to be able to access this extra RAM, although there are some advantages to doing so. The program SUPERRAMFAKE, which accompanies this article, contains a subroutine that shows how extra memory can be accessed in 6502 emulation via "long" addressing modes. We'll discuss that more a little later, but we should first look at how the SuperRAM card fits into the SuperCPU memory scheme.

For a good overview, take a look at the "SuperCPU 64/128 Common Memory Map". The areas in white (Banks $00, $01 and $F8-FF) are the memory found in every SuperCPU, with or without memory expansion. Banks $00 and $01 are static RAM, while $F8-FF are used and reserved banks for the system ROM. This map is identical on both the 64 and 128 versions of the SuperCPU, though the 128 version will have two additional banks of static RAM which will be swapped in at Banks $00 and $01 as needed.

Given the general map, there is room for expansion RAM at Banks $02 through $F7. To avoid the need to translate addresses on all expansion RAM, SIMM memory addressing actually begins at Bank $00, although any expansion RAM that occupies the same address area as Static RAM (Banks $00 and $01) or ROM ($F8-FF) isn't accessible. The SIMM RAM Banks $00 and $01 have been moved to Banks $F6 and $F7, and reserved for future system use. This then means that any system with expansion RAM (any size) will have this extra RAM available for future OS capabilities, but it also means that the last Bank available for user programs will be Bank $F5 (on a system with 16 Megabytes of expansion RAM installed).

Detecting Expansion RAM

Naturally, one of the more important questions on programmer's minds is, "How do I detect RAM expansion, and how do I

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know how much there is?" Okay, that's two questions, but we've got answers for both.

First, any new SuperCPU sold after the new SuperRAM card becomes available will sport a new version of the SuperCPU ROM. Likewise, all SuperRAM upgrades sold to users with older SuperCPUs will include the new ROM. Thus, the first step in determining if RAM expansion is present will be to check the ROM version. This is accomplished by reading four bytes, beginning at $00E487 (64 mode only!).

These four bytes contain the version number string in PETASCII. The version that will provide initial support for expansion RAM is "1.40". Read these bytes and compare for this number. If the version number is lower, there's no expansion; if it's the same or higher, there may be expanded memory, and you'll need to move on to the next step.

If you found a version that supports RAM expansion, read in four bytes beginning at $00D27C. These bytes contain the following information concerning RAM expansion:

$00D27C	First Available Page
$00D27D	Bank of First Available Page
$00D27E	Last Available Page+1
$00D27F	Bank of Last Available Page+1

If there isn't any extra RAM installed, all four bytes will contain zeroes. The BASIC program SUPERRAMDETECT provides an example of checking these parameters and calculating the available expansion memory. Please note that these variables are only valid in Bank $00 while I/O is switched in; should you need to check for expansion RAM with I/O out, these values are available in the same locations of Bank $01.

If your application needs to use some portion of expansion RAM, it must also update the memory variables. This requires switching in the SuperCPU H/W registers by storing any value at $00D07E (decimal 53374). After you have modified the variables, turn the SuperCPU H/W registers back off by storing any value to $00D07F (decimal 53375). Again, I/O must be enabled during any of these changes, or you'll need to change the variables directly in Bank $01.

It is very important that you pay attention to the expansion RAM variables, and that you don't make any assumptions with regard to RAM availability; some future system extensions or user programs may steal some of the RAM before your application is started. As a result, it would be wise to create your program code and/or data segments in a manner that allows them to be relocated. CMD is presently working toward standards and tools that will make writing and utilizing relocatable code less painful, but it will make the transition easier if 6502/65816 programmers start getting familiar with the techniques now.

To assist you in testing routines that detect RAM expansion, we've included the program SUPERRAMFAKE with this article. You may use this program to trick your SuperCPU into believing that it has RAM expansion available, as well as the proper OS version required to support it.

Speed Considerations

As you may already know, Dynamic RAM (DRAM) isn't as fast as Static RAM (SRAM), but it is far less expensive and available in larger capacities. This explains why DRAM was chosen for expansion memory.

Taking the speed into consideration, CMD employed special circuitry into the SuperRAM card's DRAM controller to help the DRAM keep up. Understanding how this controller 'thinks' is the key to optimizing the speed of expansion RAM accesses on the SuperCPU.

DRAM, unlike SRAM, must be pre-charged before valid data can be read from a specific address. DRAM also requires periodic 'refresh' in order to maintain its contents. These are the factors that add time to accessing the memory. The memory cells themselves in Dynamic memories are organized into an array of rows

Expansion RAM Speed Characteristics at 20 MHz*

Sequential Read within Row[1]:	1 Cycle
Non-seq. Read within Column[2]:	1 Cycle
Non-seq. Read, new Column[2] in Row[1]:	2 Cycles
Read from new Row[1]:	3.5 Cycles
Write within Row[1]:	1 Cycle
Write in new Row[1]:	3 Cycles
Read during Refresh[3]:	up to 8.5 Cycles
Write during Refresh[3]:	up to 8 Cycles

[1]Rows are 2K, 4K or 8K Bytes, depending on the SIMM (see SIMM Chart).
[2]Columns are groups of four bytes each on supported 72-pin SIMMs (see SIMM Chart).
[3]Refresh occurs approximately every 10 microseconds.

*At 1 MHz all times are 1 cycle (synchronized to the computer's Phase 2 clock), refresh is hidden.

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and columns. On memory modules such as the SIMMs used by the SuperRAM card, these rows and columns are combined in a way that allows all the bits in a byte or a word to be precharged and accessed as a group.

If you look at the SIMM Chart in this article, you'll notice that we included the number of addressable bits for rows and columns, as well as the number of bytes within a specific row. Let's look at the 1 MB SIMM to understand how this information describes the SIMM.

There are 9 bits used to address rows, and another 9 bits for columns. Since 2^9=512, we can deduce that there are 512*512 array crosspoints, which gives us 262,144 unique addresses. Divide that by 1024 (1K), and you'll get 256... so there are 256K addresses on this SIMM. Since each address has 32 bits of data (or 36 on a parity SIMM), there are 4*256K, or one Megabyte (1,048,576 Bytes) of 8- or 9-bit memory locations.

Still with me? Okay, we can also deduce from the SIMM is that each row contains 2 KB ($800 bytes) of 8- or 9-bit data, since there are 512 columns of 4 bytes each per row.

Now let's look at how the SuperRAM memory controller handles things. Assume for a moment that you have a routine situated at $020000, the first available expansion memory location. This location is the first byte in a row ($020000/$800=$40 with no remainder), and also the first byte of the first column of that row (always the case at the start of any new row, though we can do the math $020000/$04=$8000 with no remainder). At this location you have the following code:

```
020000 A9 03        LDA #$03
020002 8F 00 03 02  STA $020300
```

Let's assume you jump to this code from another Bank or row, and it begins executing.

SUPERRAMDETECT

```
112  5 rem get version
243  10 v$=""
118  20 fori=58503to58506
43   30 : v$=v$+chr$(peek(i))
170  40 next
136  50 v=val(v$)
118  60 :
160  70 ifv<1.40then200
138  80 :
32   100 rem get ram size & location
70   110 sp=peek(53884) : rem start page
89   120 sb=peek(53885) : rem start bank
153  130 ep=peek(53886) : rem end page
144  140 eb=peek(53887) : rem end bank
54   142 ifsb+sp=0then200
203  145 :
174  150 x=(eb*256+ep)-(sb*256+sp)
218  160 :
178  170 printx*256"bytes available"
23   180 print" starting at"(sb*256+sp)*256
63   190 end
250  192 :
43   200 print"no ram expansion"
83   210 end
```

SUPERRAMFAKE

```
201  10 print"{CLEAR/HOME}{CRSR DN}{14 SPACES
     }superramfake"
86   20 v$="1.40":sp=0:sb=0:ep=0:eb=0
144  30 h$="0123456789abcdef"
148  90 :
20   100 print"{HOME}{3 CRSR DN}{15 SPACES}1.
     {2 SPACES}0 mb"
117  110 print"{15 SPACES}2.{2 SPACES}1 mb"
147  120 print"{15 SPACES}3.{2 SPACES}4 mb"
38   130 print"{15 SPACES}4.{2 SPACES}8 mb"
78   140 print"{15 SPACES}5. 16 mb"
103  150 print"{15 SPACES}6. custom"
218  160 :
187  170 getk$:ifk$=""then170
96   180 k=asc(k$+chr$(0))-48
92   190 ifk<1ork>6thenk$="":goto170
3    200 :
126  210 onkgoto300,310,320,330,340,350
84   300 sp=0:sb=0:ep=0:eb=0:goto500
174  310 sp=0:sb=2:ep=0:eb=16:goto500
110  320 sp=0:sb=2:ep=0:eb=64:goto500
20   330 sp=0:sb=2:ep=0:eb=128:goto500
243  340 sp=0:sb=2:ep=0:eb=246:goto500
```

SUPERRAMFAKE *(cont.)*

```
146  350 gosub400:goto500
163  360 :
126  400 rem input custom values
213  410 :
91   420 print"{2 CRSR DN}enter values in hex
     !":print"note: end address is last addre
     ss+1{CRSR DN}"
54   430 input"starting bank (sb)";ui$:gosub4
     60:sb=ui
240  431 input"starting page (sp)";ui$:gosub4
     60:sp=ui
101  432 input"ending bank{3 SPACES}(eb)";ui$
     :gosub460:eb=ui
35   433 input"ending page{3 SPACES}(ep)";ui$
     :gosub460:ep=ui
68   440 return
253  450 :
140  460 ui=0
132  462 fori=1to16
141  464 : ifleft$(ui$,1)=mid$(h$,i,1)thenui=
     ui+((i-1)*16)
59   466 : ifright$(ui$,1)=mid$(h$,i,1)thenui
     =ui+(i-1)
90   470 next
108  480 return
38   490 :
194  500 rem store dummy values
45   501 :
110  504 pl=124039:fori=1to4:pv=asc(mid$(v$,i
     ,1)):gosub518:pl=pl+1:next
49   505 :
44   506 pl=119420:pv=sp:gosub518
225  507 pl=pl+1:pv=sb:gosub518
222  508 pl=pl+1:pv=ep:gosub518
11   509 pl=pl+1:pv=eb:gosub518
58   510 :
211  516 sys64738
61   517 :
131  518 b=int(pl/65536):h=int((pl-(b*65536))
     /256):l=pl-((b*65536)+(h*256))
67   519 :
104  520 poke49152,169 : rem lda#
100  521 poke49153,pv  : rem value to store
230  522 poke49154,143 : rem sta abs long
36   523 poke49155,l   : rem lo addr
168  524 poke49156,h   : rem hi addr
187  525 poke49157,b   : rem bank
230  526 poke49158,96  : rem rts
75   527 :
188  528 sys49152
162  530 return
```


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Normally the LDA immediate would require 2 cycles to complete; 1 cycle to load the instruction, and 1 cycle to fetch the immediate byte into the accumulator. But in this case it would require 4.5 cycles; 3.5 cycles to fetch the instruction from a new row in expansion RAM, then 1 more cycle to fetch the immediate byte. The latter took only 1 cycle because the row and column were already charged, and the controller knows this. If you're wondering how an operation can take an uneven number of cycles, you need to take a look at the sidebar on *Clock Stretching*.

Now the next instruction, STA, is fetched in 1 cycle, and the three address bytes are all fetched at 1 cycle for each. When the second byte of the address (the $03 at $020004) is fetched, we cross over into a new column. Normally this would require an extra cycle, due to column address access timing requirements; however, the controller outputs the next column address when the processor reads from $020003 by assuming that the next access will be in the following memory location. By always 'guessing' that the next access will be sequential, the DRAM controller saves time when this proves to be the case.

Back to the example, there's one operation left to perform: store the accumulator to memory. This usually takes 1 cycle, but the location where it is to be stored is in a distant column of the same row, so it takes 2 cycles.

This set of instructions would normally take 7 cycles in SRAM, but in expansion RAM, it requires 10.5 cycles. This may seem slow at first, but when contrasted with a stock 64 running at 1 MHz, we're still operating over 13 times faster (the throughput is approximately 13.4 MHz in this particular case). We could also modify the program so that the store instruction places the value into Static RAM instead of Dynamic, say at $003000, and save an additional cycle. This would kick the effective speed up to 14.7 MHz.

It's also important to note that most of our loss in throughput came when our code began executing in a new row. This doesn't happen often, since rows are at least 2 KB wide. Consider a whole 2 KB segment of contiguous code executing from DRAM, with all external reads and writes going to Static RAM. Under those circumstances you might achieve a throughput of over 19.9 MHz—not considering refresh or occasional jumps and branches.

Refresh? Yes, DRAM needs to be refreshed to maintain its contents, and at these speeds, it can no longer be 'hidden' as it commonly is at 1 MHz. Refresh occurs once approximately every 10 microseconds (about 200 cycles) and can cause a 1 cycle DRAM memory operation to take up to 8.5 cycles to complete. We could see up to 11 refreshes while executing a 2 KB segment of code, so if take this into consideration, our throughput drops to about 19.2 MHz.

Now if we also consider a branch or jump every 20 bytes (that's actually quite a high average), we get an overall throughput of around 18.3 MHz; still a remarkably good figure. Naturally, your own programs will vary from this mark, depending on how you write them, and how often you perform other accesses that can cause slowdowns (such as I/O access or frequent writes to mirrored memory).

Other SuperCPU Timing Issues

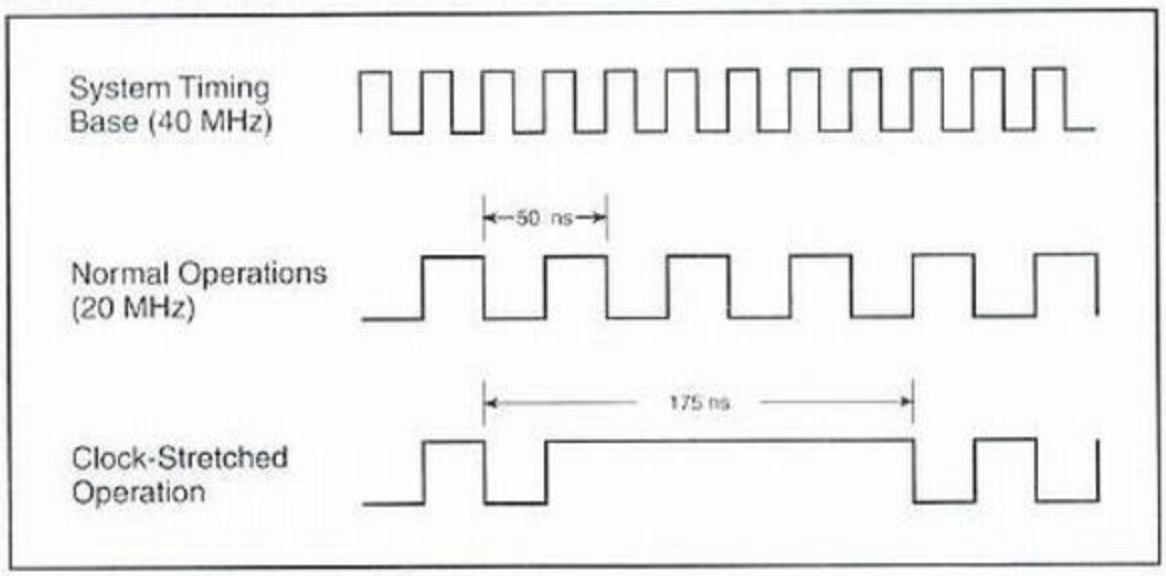
With the proverbial 'can of worms' now open, let's consider the other timing aspects of the SuperCPU. The SuperCPU Special Function Timing Chart will be our guide as we discuss the various functions. Please note that the signal relationships on the chart have been calculated using the NTSC dot clock frequency, but the times indicated are identical on PAL systems.

Access to Static RAM is always one cycle for reads. Writes also take one cycle—except under certain conditions. What can slow down a write is 'mirroring', where data is being written through to the RAM in the host computer. Mirroring is performed in order to make sure that the VIC chip, which reads screen and color data from the computer's own RAM, has proper data for the display. Since it isn't possible to detect in real time exactly where (in memory) the VIC will be looking for data, the SuperCPU's default is to mirror all writes to Bank $00 RAM.

A mirrored write doesn't automatically mean a speed penalty, however, since the SuperCPU employs a one-byte cache (buffer) for write-throughs. Refer to the Mirrored Memory Cache Latch timing. You'll see that the cache is cleared during the low phase of

Clock-Stretching

While many of the operations within the SuperCPU occur at a normal 20 MHz rate, some operations may take longer than the single cycle in which they should usually occur on a 1 MHz Commodore computer. Under these circumstances, the high half of the clock signal is stretched to meet the requirements of the operation. In the example below we show the System Timing Base (40 MHz) and how the System Clock itself would look while executing instructions at full speed (Normal Operations). The bottom example shows what happens during an operation that requires 3.5 20 MHz clock cycles to complete. The low part of the cycle has a duration of 25 nanoseconds, or half of the duration of a 20 MHz cycle; the high portion of the cycle is stretched, giving it a duration of 150 nanoseconds. The total duration of this cycle is 175 nanoseconds, or 3.5 times the 50 nanosecond period of a standard 20 MHz cycle. You may note that this causes what may appear to be a phase inversion; that is to say, the clock signal is now low during a period in which it originally would have been high, and vice-versa. This factor is of no importance, however, and only becomes an issue when synchronization with the host computer's clock becomes necessary. When that occurs, clock stretching is used as required to bring the SuperCPU clock into phase with the host computer's clock.



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the first dot clock cycle following the computer's Phase 2 signal going low. The latch stays low for 25 ns, and the cache is then ready for another byte to be written through. Any byte must be in the cache at least 70 ns prior to the dot clock high transition that signals the computer's Phase 2 line to go high—any later than this and the cache mechanism has to wait until the Phase 2 clock cycles around again. In either case, the operation of the cache is transparent to program timing as long as no additional mirrored writes occur while the cache latch status is high.

This leads us to consider what happens if the cache is already full when a mirrored write occurs. The result is a clock stretch for the SuperCPU Phase 2 clock, which will stay high until the cache is cleared. Once this has occurred, the waiting byte can be put into the cache, and the SuperCPU returns to normal 20 MHz operation. Spacing writes to mirrored memory (as well as using the optimization modes to reduce mirroring) will help maximize program efficiency. With one mirrored store every 19th cycle you'll get maximum throughput of one cache write per 1 MHz cycle, provided there are no other special functions that slow things down.

The next area we'll look at is I/O access, which covers reads and writes to $00D000-$00DFFF with I/O switched in, and also includes a few miscellaneous locations. Most I/O reads and writes follow the timing specification shown as SCPU Phase 2 I/O Reads/Writes. Any store or load cycle to I/O causes the SuperCPU Phase 2 line to go high until the data can be written or read. The store or load must occur at least 70 ns prior to the dot clock high transition that signals the computer's Phase 2 line to go high in order to have the I/O access occur during the current 1 MHz cycle. If the access is to standard I/O, the SuperCPU Phase 2 will transition low about 105 ns after the rising edge of the dot clock cycle that signals the host computer's Phase 2 to go low. This timing of the SuperCPU's Phase 2 line also applies to cache full mirrored writes to RAM, memory location $000001, and reads from $00DF01, $00DF21, $00FF00. Furthermore, this timing is used to read from ROM cartridges installed in the $008000-$009FFF or $00A000-$00BFFF memory areas. An 8-cycle spacing of standard I/O access provides best throughput.

In addition to standard I/O reads and writes, there is a Long I/O Write timing specification that applies to locations $00DF01, $00DF21 and $00FF00. The long write has the same input deadline as all other special timing functions, but holds the SuperCPU Phase 2 line high 24 ns past the start of the fourth dot clock cycle after the computer's Phase 2 is signaled to go low. This timing was created to satisfy requirements of Commodore REU DMA operations.

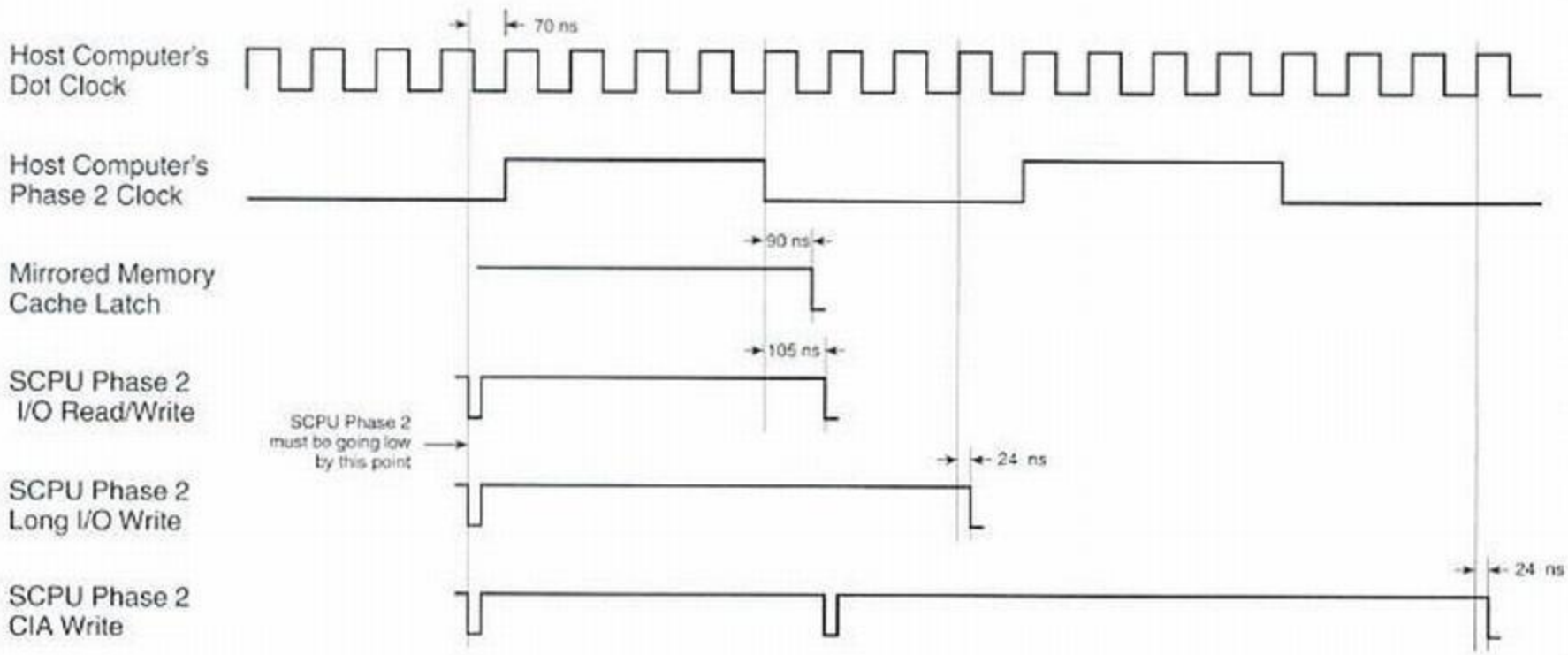
The final special I/O timing specification only applies to writing to the CIA chips ($00DC00-$00DDFF). Here, a standard I/O write is performed, but the next processor cycle (usually a fetch of the next opcode) is stretched into the next computer Phase 2 cycle, and ends where a long I/O write would end. It was necessary to use this timing to make it impossible to read back from a CIA during the two 1 MHz cycles following the write. The reason? Because the CIA I/O lines are terminated with resistors, causing them to react slowly when going high. Reading too soon can generate erratic results.

Last of all, there is one final inconsistency in timing that isn't indicated on the chart. This applies to accessing the special SuperCPU RAM placed in the I/O area. Access to this RAM takes two 20 MHz cycles instead of one, because the SuperCPU needs to first decode that this area isn't actual I/O before it can perform the load or store function requested.

Conclusion

There are many factors to consider if your program is to achieve optimal throughput. Reducing mirroring, spreading special accesses, and optimizing routines that really need it will give you the most speed for your effort, without making the process excessively difficult and time-consuming.

SuperCPU Special Function Timing Chart


70 ns
Host Computer's Dot Clock
Host Computer's Phase 2 Clock
90 ns
Mirrored Memory Cache Latch
105 ns
SCPU Phase 2 I/O Read/Write
SCPU Phase 2 must be going low by this point
24 ns
SCPU Phase 2 Long I/O Write
24 ns
SCPU Phase 2 CIA Write

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CHECKSUM

Commodore World's Program Entry Checking Program and Tips on Entering Programs from this Magazine

CHECKSUM is a program that proofreads your typing when you enter a listing from the magazine. It assigns a numerical value to each character that you type, adds up the values of the line you typed and displays the sum. (Checksum, therefore, means that it checks your typing by summing the characters.) It also verifies that you have typed the characters in the proper order. (Checksum won't tell you if you miss a line of code entirely, so verify that yourself.) Checksum runs "in the background" when you type in lines of program code. Whenever you type a line and press RETURN, Checksum will display a value. Compare that value to the value published next to the line of code in the magazine. If the numbers match, you've typed the line correctly. Simple.

Typing in CHECKSUM

First, type in Checksum carefully from the listing on this page. Be sure to press RETURN after every line to enter it into memory. Once you have typed the program, *save it*. In fact, save it a few times while you're typing, just to be safe. (This is good advice whenever you type in a program. I usually change the name each time I save; for example, Checksum1, Checksum2, and so on.) Double-check your work, making sure that you've typed in every line and that you've pressed RETURN after every line you've typed. If you make errors when typing in Checksum, a test run of Checksum will tell you which line is incorrect. (This safety feature works only in the Checksum program itself, and does not apply to any other listings in the magazine.) Whenever you find a typing error (in any program listing), fix it, press RETURN to enter the change, save the program again and try another run. Repeat this process as often as necessary. Important tip: Don't get discouraged if the program won't run. Be patient. Be thorough. It will work eventually. You'll know your Checksum is ready when you see the line:

```
TO TOGGLE ON OR OFF, SYS XXXX
```

Entering Programs Using CHECKSUM

When you're ready to type in your first listing from the magazine, load and run Checksum. Make a note of the number that is displayed on the screen (49152 for the C-64; 3328 for the C-128). To activate and deactivate Checksum, type SYS followed by that number, then press RETURN. You need to have Checksum active whenever you're typing in a listing. Checksum must be deactivated, however, when you run the new program. The next step is typing in a new program listing as it appears in the magazine.

As you begin, you'll notice that to the left of the start of each line is a number. Don't type this number in: It's simply the Checksum value. Stop typing at the end of the program line and press RETURN. If you've typed the line correctly, the number displayed on the screen will match the Checksum value. If the numbers don't match, you've made a mistake. Check the line carefully, make your changes and press RETURN. The computer won't know you've made a change unless you press RETURN on the changed line to enter it. A few type-in hints: The Checksum does not verify blank spaces in the program lines unless they are within quotation marks, because adding or omitting such spaces will not affect the operation of the program. The exception to this is hexadecimal Data statements. These are the Data statements, such as this one, that don't have commas:

```
100 DATA 12345678901234567890*123456789012345
67890*12345678901234567890*
```

In statements such as these, you must have one space between the word DATA and the numbers that follow. Checksum will not catch that error.

Special Key Combinations

As you type, you may be confused the first time you see curly braces {}. These braces mean "perform the function explained within." For example, {22 SPACES} means that you need to press the space bar 22 times. Don't type the braces (you can't, of course, because there are no curly braces in the Commodore character set). Here are some other common examples:

{CLEAR/HOME}	hold down the SHIFT key and press the CLR-HOME key.
{2 CRSR DN}	tap the cursor down key twice.
{CTRL i}	hold the CONTOL key and press the I key.
{CMDR t}	hold down the COMMODORE key and press the T key.

Continue typing in your program, saving often and checking each checksum value with the one in the magazine, until you've finished the listing. Phew! So now you're ready to run your program, right? Not quite. First, save it. Second, deactivate Checksum by typing SYS followed by 49152 for the C-64 or 3328 for the C-128. Now you can run. Don't be discouraged if you still get an error. It happens. Use Checksum faithfully. Be patient. Be thorough. It will work eventually.

CHECKSUM

```
100 rem cw checksum 64/128
110 mo=128:sa=3328
120 if peek(65533)<>255 then mo=64:sa=49152
130 i=0:ck=0:ch=0:ln=300
140 for k=0 to 16
150 for j=1 to 10
160 read b:if b>255 then goto 280
170 ch=ch+b:poke sa+i,b:i=i+1
180 next j
190 read lc:if lc<>ch then goto 280
200 ch=0:ln=ln+10
210 next k
220 pokesa+110,240:pokesa+111,38:pokesa+140,234
230 printchr$(147):print"cw checksum";str$(mo):print
240 print"to toggle on or off, sys";sa:if mo=128 then 270
250 pokesa-13,124:pokesa+15,165:pokesa+25,124:pokesa+26,165
260 pokesa-39,20:pokesa+41,21:pokesa-123,205:pokesa+124,189
270 pokesa+4,int(sa/256):sys sa:new
280 print"you have a data error in line";ln;"!":end
290 rem do not change these data statements!
300 data 120,162,24,160,13,173,4,3,201,24,884
310 data 208,4,162,13,160,67,142,4,3,140,903
320 data 5,3,88,96,32,13,67,152,72,169,697
330 data 0,141,0,255,133,176,133,180,166,22,1206
340 data 164,23,134,167,132,168,170,189,0,2,1149
350 data 240,58,201,48,144,7,201,58,176,3,1136
360 data 232,208,240,189,0,2,240,42,201,32,1386
370 data 208,4,164,180,240,31,201,34,208,6,1276
380 data 165,180,73,1,133,180,230,176,164,176,1478
390 data 165,167,24,125,0,2,133,167,165,168,1116
400 data 105,0,133,168,136,208,239,232,208,209,1638
410 data 169,42,32,210,255,165,167,69,168,170,1447
420 data 169,0,32,50,142,169,32,32,210,255,1091
430 data 32,210,255,169,13,32,210,255,104,168,1448
440 data 96,104,170,24,32,240,255,104,168,96,1289
450 data 56,32,240,255,138,72,152,72,24,162,1203
460 data 0,160,0,32,240,255,169,18,208,198,1280
```


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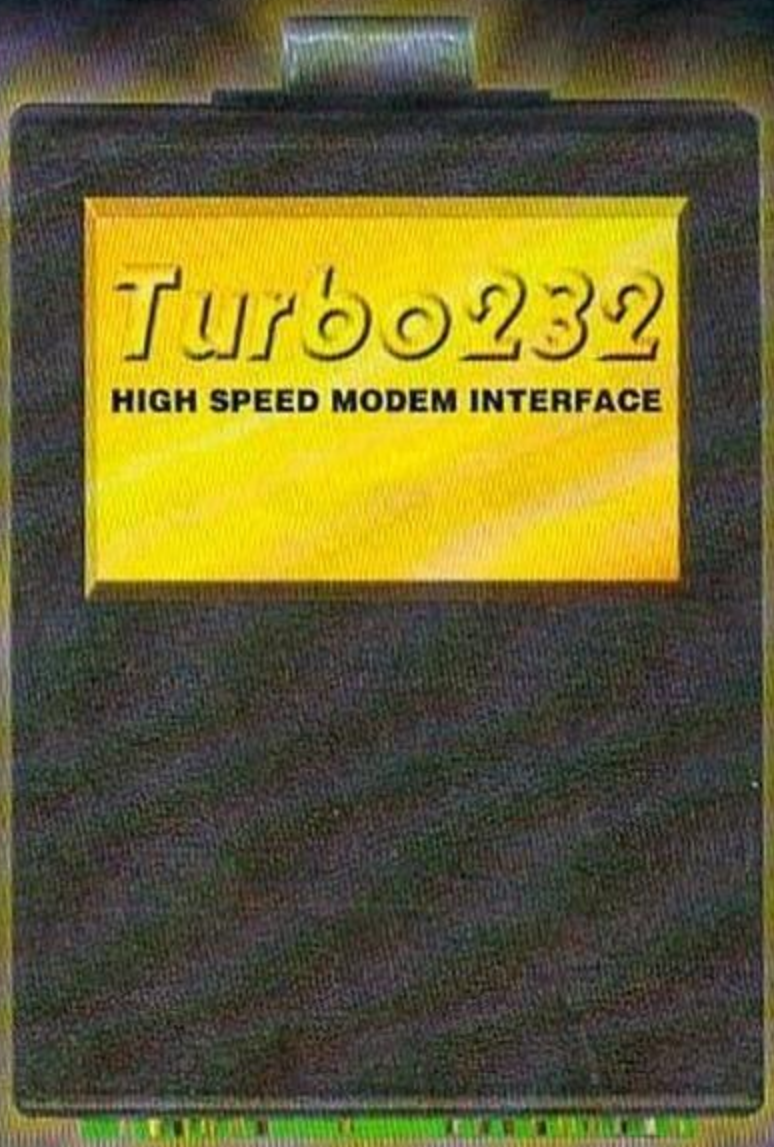

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